

National Park Service
U.S. Department of the Interior

Capitol Reef National Park, Utah



State Route 24 Erosion Control Measures Environmental Assessment

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**U.S. Department of the Interior
National Park Service**

Environmental Assessment

State Route 24 Erosion Control Measures

**Capitol Reef National Park
Wayne County, Utah**

Summary

The National Park Service and the Utah Department of Transportation proposes to install erosion control/bank stabilization measures along State Route 24 within Capitol Reef National Park. The proposed project encompasses the area east of the Fruita Historic District to the eastern National Park boundary. The proposed project includes removing emergency erosion control/bank stabilization measures placed after a large flood event occurred in August 2003. The purpose of this Environmental Assessment/Assessment of Effect is to describe the affected environment and analyze potential impacts associated with the Proposed Action and alternatives.

The Proposed Action would have no impact on the socioeconomic environment, prime and unique farmlands, environmental justice, air quality, wetlands, land use, threatened and endangered species, Indian trust resources, museum collections, cultural landscapes, and historic structures and buildings. Impacts to visitor use and experience would be minor and adverse in the short-term and moderate and beneficial in the long-term. Impacts to biotic communities would be minor and adverse in the short-term and moderate and beneficial in the long-term. Impacts to the soundscape would be minor and adverse in the short-term. Impacts to soils would be negligible and adverse in the short-term and minor to moderate and beneficial in the long-term. Impacts to visual and aesthetic resources would be minor and adverse in the short-term and moderate and beneficial in the long-term. Impacts to archeological and ethnographic resources would be negligible to minor and adverse in the short and long-term. Impacts to water resources, including floodplains, would be minor and adverse in the short-term.

Note Regarding Public Comment

If you wish to comment on the Environmental Assessment/Assessment of Effect, you may send comments to the name and address below. This Environmental Assessment/Assessment of Effect will be on public review for 30 days. Please note that names and addresses of people who comment become part of the public record. If you would like your name and/or address withheld, please state this prominently at the beginning of your comment. All submissions from individuals, organizations, and businesses will be made available in their entirety for public inspection.

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PURPOSE AND NEED

PURPOSE

Utah State Route 24 (SR-24), the main access road to Capitol Reef National Park (Park) and a designated scenic byway, crosses the Park between the towns of Torrey to the west and Hanksville to the east (Figure 1). Within the Park, SR-24 follows the Fremont River, a perennial river, from the eastern boundary to just east of the visitor center. Because the river and road are located in the bottom of an incised, narrow canyon, during periods of high water, the road bank suffers increased threats of erosion, prompting the Utah Department of Transportation (UDOT) to periodically fortify the bank and install erosion control measures, including stream flow controls.

Several years of such streambank fortification and stream flow control measures, coupled with the largest flood event with the last 19 years, which occurred on August 23, 2003, has necessitated erosion control work on SR-24. The flood resulted in debris deposition on SR-24 and portions of the road being damaged. The water undercut some existing erosion control facilities. Additionally, in places the Fremont River is eroding the bank, and so the river is encroaching on SR-24, eroding supporting roadbank material. In order to maintain a safe and reliable highway, some repair work and erosion control/bank stabilization is required.

The proposal includes clearing debris, installing erosion control/bank stabilization measures, and replanting vegetation. The erosion control/bank stabilization measures would be installed at 12 predetermined sites (Figure 2). Site photographs are found in Appendix C. Installation of erosion control/bank stabilization measures would repair damage to streambanks that support SR-24, improving the safety of the highway. The erosion control/bank stabilization work would also include habitat improvements at sites that would undergo construction activities.

This proposal would allow UDOT to maintain SR-24, a major state highway with average daily traffic (ADT) > 350, while providing National Park Service (NPS) the opportunity to meet and uphold its mandate to administer and protect the Park for the enjoyment of natural, cultural, and scientific resources in a manner that leaves these resources unimpaired. Repairing the streambanks that support SR-24 would provide visitors safer means of transportation to Park attractions. It will also provide safer passage for traffic traveling through the Park to either Torrey or Hanksville.

NEED

On August 23, 2003 Sulphur Creek, which joins the Fremont River within the Park boundaries, overflowed its banks and a rush of water washed down the Fremont River. The event resulted in several areas where the SR-24 roadbank was severely eroded and portions of SR-24 were washed away. The large volumes of water carried debris and silt across the roadway and undercut several existing erosion control measures. SR-24 was closed while emergency maintenance actions ensued. This Environmental Assessment (EA) is being prepared to assess the impacts and affects associated with the work required to repair the damage and provide erosion control measures to inhibit future damage due to flood events and stream erosion.

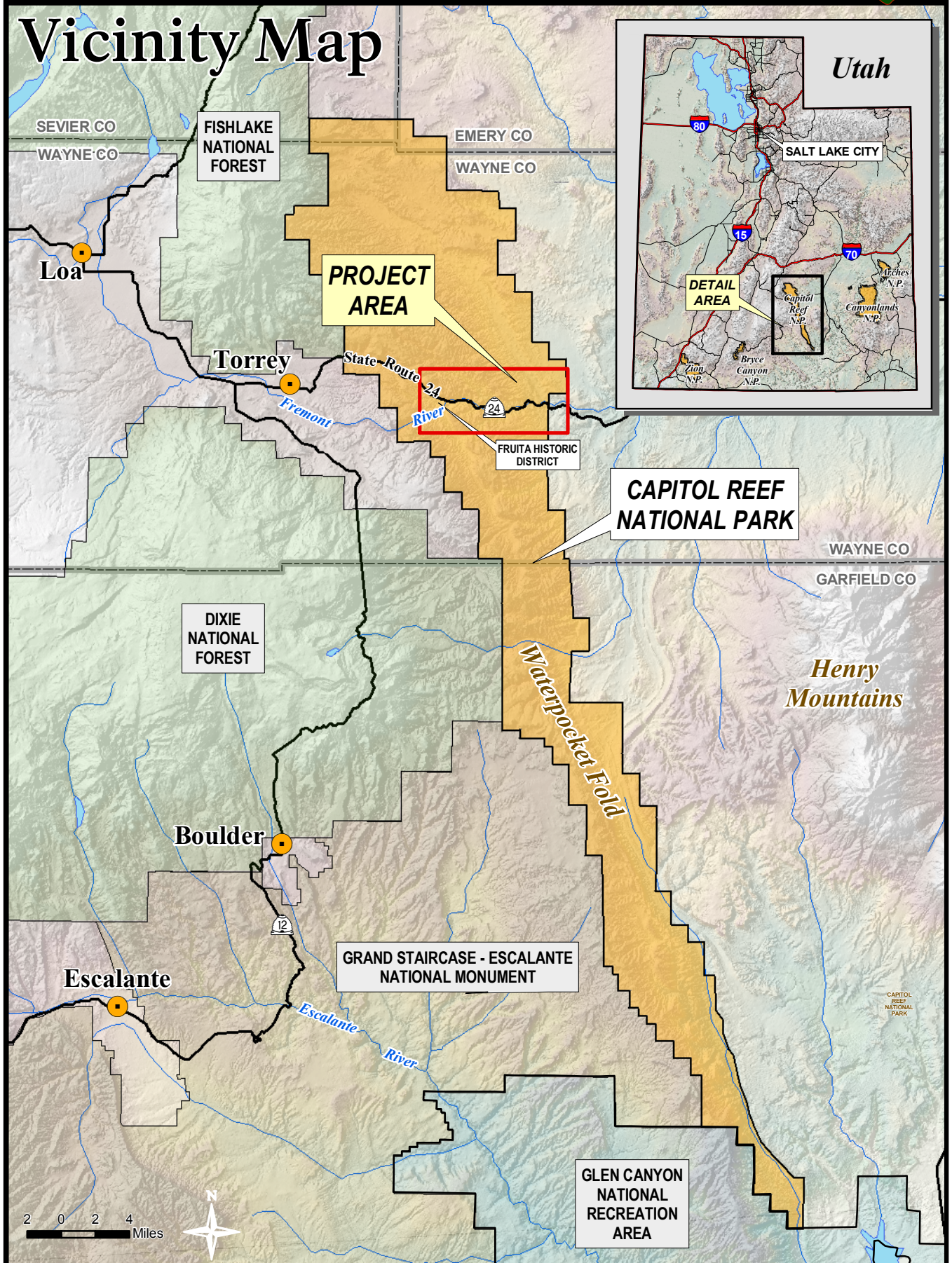


Figure 1. Vicinity Map



State Route 24

CAPITOL REEF NATIONAL PARK

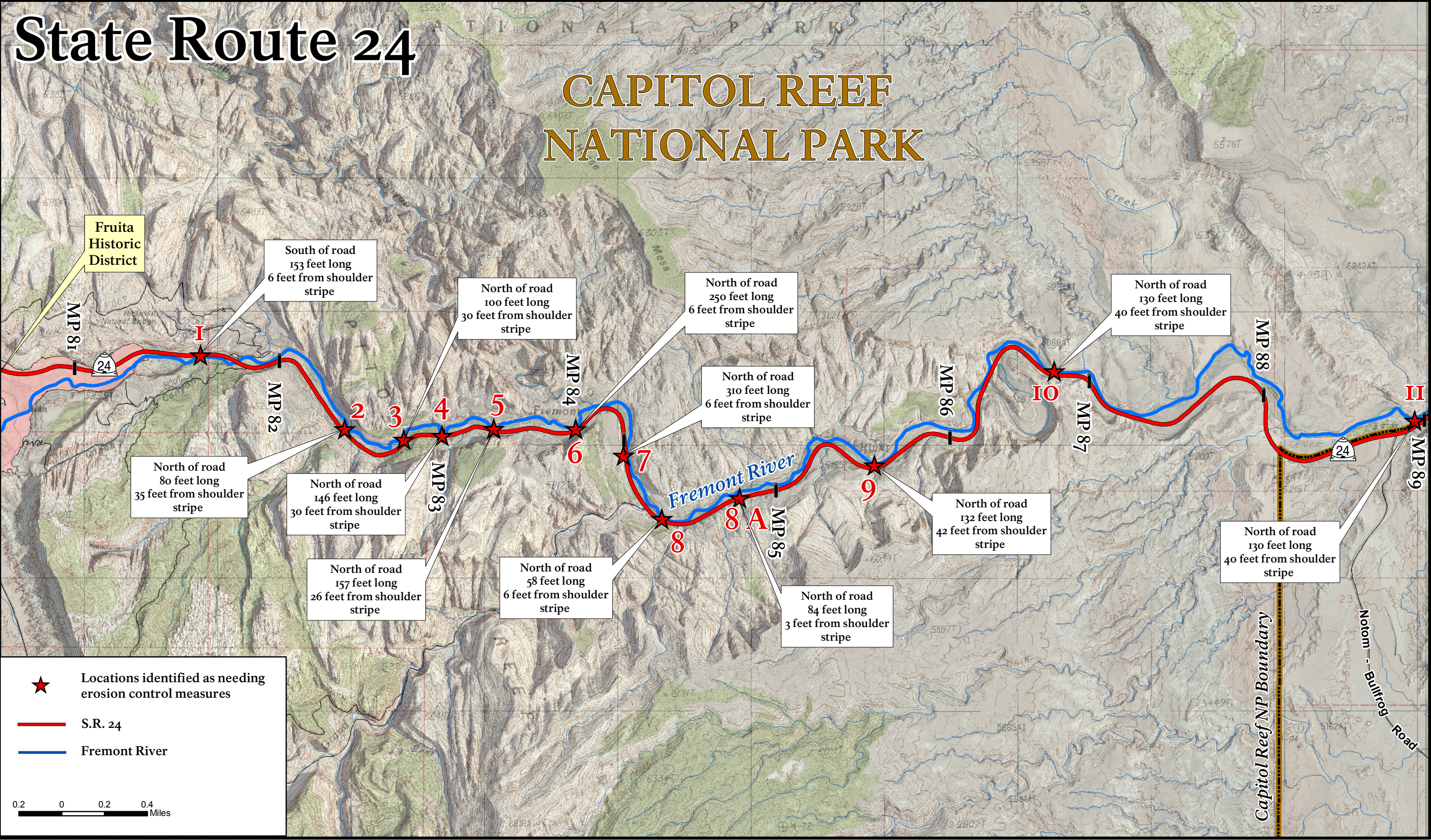


Figure 2. Project Area

OBJECTIVES

The objectives of this EA were developed by the interdisciplinary team during project scoping. The interdisciplinary team considered the management objectives for the Park, the need for reliable and safe travel on SR-24, and habitat quality in developing the objectives for this EA. The objectives are:

- To protect and provide for the enjoyment of natural, cultural, and scientific resources;
- To maintain the safety of SR-24, a major central Utah highway; and
- To improve habitats along the Fremont River.

SCOPING

Scoping is an open process to determine the breadth of environmental issues and alternatives to be addressed in an EA. Scoping involves obtaining internal and external input on project-related issues from resource specialists and the public, respectively. The Park conducted internal scoping with appropriate NPS staff and external scoping with the public including interested and affected groups or individuals, and non-NPS agency personnel through the publication of public notices in area and regional newspapers.

An interdisciplinary team comprising of Park and UDOT staff members contributed to the internal scoping process. This process resulted in definition of the purpose and need, identification of objectives, identification of potential actions to address the need, determination of what the likely issues and impact topics would be, and identification of the relationship, if any, of the Proposed Action to other planning efforts in the Park.

Early public involvement actions sought input during the scoping process. These actions included publishing a public notice in newspapers local to the Richfield and Salt Lake City areas (as is normally done by Park staff for such actions) and notifying Native American Tribes and requesting input. One tribe requested more information about the proposed project and, after consultation with local Park staff, concurred that no adverse effect would result from the proposed project. One other tribe indicated there were no known impacts to its own cultural resources as a result of this project. No other comments were received during this early public involvement period. These public comments contributed to project planning by providing input as to what resources should be analyzed. More details regarding public involvement are found in Chapter 4.

RELATIONSHIP OF THE PROPOSED ACTION TO PREVIOUS PLANNING EFFORTS

Repairing the damaged portions of SR-24 and fortifying SR-24 against future damage of such magnitude coincides with safety concerns of NPS and UDOT. By utilizing erosion control methods that complement the natural setting of the Park, the Proposed Action is consistent with the objectives of the Capitol Reef National Park *Final Environmental Impact Statement, General Management Plan, and Development Concept Plan* (2001), which outlines the management, use, and development of the Park through the year 2013.

REGULATIONS AND POLICIES

The undertakings described in this document are subject to various regulations and policies. In addition to NPS enabling legislation and management policies, the Clean Air, Clean Water,

Endangered Species, National Environmental Policy, NPS Organic, National Parks and Recreation, National Historic Preservation, and Native American Graves Protection and Repatriation Acts apply.

IMPACT TOPICS ANALYZED IN THIS ENVIRONMENTAL ASSESSMENT

NPS and UDOT specialists identified issues and concerns affecting the Proposed Action. Impact topics are the resources of concern that could be affected by the range of alternatives. Specific impact topics were developed to ensure that alternatives were compared on the basis of the most relevant topics. The following impact topics were identified on the basis of federal laws, regulations, orders, and NPS *Management Policies* (2001); and from input by the State of Utah Historic Preservation Officer (SHPO). A brief rationale for the selection of each impact topic is given below.

Visitor Use and Enjoyment

The August 23, 2003 flood caused considerable damage to SR-24 and the Fremont River banks at several locations. In response to the damages, NPS and UDOT initiated emergency maintenance activities along SR-24. Currently, SR-24 is deemed less safe because of the damage incurred as a result of the flood. The emergency maintenance actions are not aesthetically pleasing or beneficial to habitats along the Fremont River. Should the Proposed Action be implemented, appropriate measures to repair damages, inhibit or control future erosion, improve aesthetics, and improve habitats would occur. If the Proposed Action were not implemented, the current conditions may result in adverse effects to visitor use and experience. Therefore, Visitor Use and Enjoyment is addressed as an impact in this EA.

Biotic Communities

Biotic communities along the Fremont River were disrupted as a result of the flood and the emergency maintenance activities. The Proposed Action includes measures that would reclaim damaged biotic communities and improve riparian and aquatic habitats along the Fremont River. Because the Proposed Action would affect biotic communities, these communities are addressed in this EA as an impact topic.

Soundscape

Short-term noise increases are possible during construction activities associated with the Proposed Action. Therefore, this issue was retained as an impact topic.

Soils

The August 23 flood displaced soil along the Fremont River and washed out portions of the SR-24 roadbed. The Proposed Action, in stabilizing the streambank and fortifying the SR-24 roadbed, would disturb soils. The construction activities of the Proposed Action would use natural soils to replace excavated material and the areas disturbed by construction would be reclaimed to a natural state. Because there would be short- and long-term effects associated with the Proposed Action, soils are addressed as an impact topic in this EA.

Visual and Aesthetic Resources

The emergency maintenance procedures taken after the August 23 flood are not aesthetically complementary to the natural setting of the Fremont River. If the Proposed Action were implemented, these areas would be reconstructed, resulting in a natural setting that would be

more aesthetically pleasing. Because the Proposed Action would affect visual and aesthetic resources, this topic is addressed as an impact topic in this EA.

Archeological and Ethnographic Resources

Evidence of early human existence is widespread in the Park. Dating from prehistoric times to more recent white settlement of the area, artifacts are present throughout the Park. The Fremont River was a focal point for early peoples of the area, providing a source of water for drinking and agriculture, wildlife, and supporting vegetation that served to aid in shelter. Along the corridor, several examples of rock art exist, of which local tribes have historically expressed concern. Related to this particular study, the ethnographic and archeological resources are the same. Because of the abundance of known archeological and ethnographic resources throughout the area and the potential for impacts to unknown resources, archeological and ethnographic resources, collectively, is discussed as an impact topic in this document.

Water Resources, Including Floodplains

NPS policies require protection of water quality consistent with the provisions of the Clean Water Act of 1977, a national policy to restore and maintain the chemical, physical, and biological integrity of the nation's waters and to prevent, control, and abate water pollution. Section 404 of the Clean Water Act authorizes the U.S. Army Corps of Engineers to prohibit or regulate, through a permitting process, the discharge of dredged or fill material into U.S. waters.

SR-24 parallels the Fremont River, a perennial river flowing generally from west to east in the Park. Because the Proposed Action consists of working within the stream channel and the floodplain areas of the Fremont River and/or its tributaries, water resources and floodplains are addressed as an impact topic in this document.

IMPACT TOPICS DISMISSED FROM FURTHER CONSIDERATION

Socioeconomic Environment

The Proposed Action would not affect the economies of nearby communities, nor affect the economy of the Park in the long-term. The proposed action would require traffic management methods to allow vehicles to pass along SR-24 while work is in progress. Through the use of these methods, SR-24 would remain open. Additionally, work would take place during times of seasonally low visitorship, lessening the amount of traffic required to work around construction. This would have negligible effects on traffic flow and park visitors. The work performed would require the purchase of materials/services from local suppliers. The Proposed Action would be funded through UDOT's budget and would not affect the Park's funds. Since there would be no adverse impacts to the socioeconomic environment, the socioeconomic environment will not be addressed as an impact topic in this document.

Prime and Unique Farmlands

In August 1980, the Council on Environmental Quality (CEQ) directed that federal agencies must assess the effects of their actions on farmland soils classified by the U.S. Department of Agriculture's Natural Resources Conservation Service (NRCS) as prime or unique. Prime or unique farmland is defined as soil that particularly produces general crops such as common foods, forage, fiber, and oil seed; unique farmland produces specialty crops such as fruits, vegetables, and nuts. The project area is entirely within the Fremont River meander corridor/floodplain and consists of alluvial and roadbase soil materials. Native vegetation

thrives in these soils and there is no evidence of agricultural practices in the project area. The historic orchards of Fruita are located west of the project area and the Proposed Action would not impact them. Since the project area does not meet the definition of farmland as stated in Title 7, Chapter 73, Section 4201 (c)(1) of the Farmland Protection Policy Act (FPPA), it is not applicable to the FPPA. Therefore, the topic of prime and unique farmlands was dismissed as an impact topic in this document.

Environmental Justice

Executive Order 12898, "General Actions to Address Environmental Justice in Minority Populations and Low-Income Populations," requires all federal agencies to incorporate environmental justice into their missions by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs and policies on minorities and low-income populations and communities. Because the Proposed Action would affect all Park visitors equally, and there are no communities living in the vicinity of the project, it would not have disproportionate health or environmental effects on minorities or low-income populations or communities as defined in the Environmental Protection Agency's Environmental Justice Guidance (1998). Therefore, Environmental Justice was dismissed as an impact topic in this document.

Air Quality

The Park was designated Class 1 under the 1977 Prevention of Significant Deterioration (PSD) amendments to the Clean Air Act. A Class 1 designation affords the strictest standards by which impacts to air quality are controlled, as compared to baseline data. Air quality could be impacted by the construction phase of the Proposed Action; however, impacts would be temporary and minor. Overall, there would be a slight and temporary degradation of local air quality due to dust generated by activities and emissions from construction equipment. These effects would last only during construction activities. Best Management Practices would be utilized to limit dust. To keep equipment emissions down, equipment would be properly maintained. The Park's Class 1 air quality would not be affected by the proposal. Therefore, air quality was dismissed as an impact topic in this document.

Wetlands

The project area resides within the Fremont River meander corridor. The project sites consist of either alluvial soils or roadbase material and are not hydric. Riparian habitats dominate and wetland characteristics are not present. NPS staff have not identified any wetlands within the project area. Since the project area does not consist of any wetland habitat and there are no identified wetlands in the project area, wetlands was dismissed as an impact topic in this document.

Land Use

The Proposed Action would not affect how the Park is managed, nor would it impede the management of the Park. As a state highway that serves commuter and tourist traffic through the Park, the Proposed Action would not negatively impact SR-24. Since there are no adverse impacts to local and regional land use, this topic was dismissed as an impact topic in this document.

Threatened and Endangered Species

For federally sponsored projects, the Endangered Species act (Act) of 1973, as amended, requires examination of potential impacts to Threatened, Endangered, and Candidate Species. Section 7 of the Act requires federal agencies to ensure that any activities they authorize, fund, or implement do not jeopardize the continued existence of any wildlife species federally listed as threatened or endangered and do not destroy or adversely modify designated critical habitat. NPS policy requires examination of potential impacts on federal candidate species, as well as state-listed threatened, endangered, candidate, rare, declining, and sensitive species with potential to occur within the project area. For simplicity, the state-listed species identified in this EA are collectively described as Species of Special Concern.

In a letter dated March 1, 2004 (Appendix A), the NPS provided a list of federally listed and candidate species that could potentially occur in the project area to the U.S. Fish and Wildlife Service (USFWS), and sought concurrence that the Proposed Action would not adversely affect listed or candidate species or proposed or designated critical habitat. In a memo dated March 8, 2004, the USFWS concurred that the Proposed Action was “not likely to adversely affect” any listed species, including Mexican spotted owl individuals, or adversely modify or destroy Mexican spotted owl critical habitat. Also, the NPS has no record of federally listed species occurring within the project area. The listed bird species (Mexican spotted owl, southwestern willow flycatcher, and bald eagle) have the potential to occur as transients within the project area, but there are no known nesting or roosting sites for these species in close proximity to the project area. Therefore, no adverse impacts to Threatened and Endangered Species would be anticipated with implementation of the Proposed Action and the topic of Threatened and Endangered Species was dismissed as an impact topic.

The Utah Conservation Data Center website was reviewed for a list of Species of Special Concern that may occur within the project area. The Utah Division of Wildlife Resources, which also manages the Utah Natural Heritage Program, contributes information for plants and animals. Four state-listed animal species and seven plant species were identified as potentially occurring within the project area. A letter addressed to the Utah Division of Wildlife Resources, dated December 10, 2003 (Appendix A), described the project area and the Proposed Action and requested concerns related to state-listed species. A telephone communication that occurred on January 9, 2004 (Appendix A) indicated the UDWR had no concerns. Therefore, because neither the UDWR or the USFWS expressed any concerns (all of the state-listed species are also federally listed), and also because there is no vegetation at any of the project sites, Species of Special Concern was not discussed as an impact topic.

Table 1 lists the federally threatened, endangered, and candidate plant and animal species and the state plant and animal species of concern that may occur within the project area.

Table 1. Federally Listed Threatened, Endangered, and Candidate Species and Species of Special Concern that May Occur within the Project Area			
Common Name	Scientific Name	Federal Status	State Status
Bald eagle	<i>Haliaeetus leucocephalus</i>	Threatened	NA
Barneby reed-mustard	<i>Schoenocrambe barnebyi</i>	Endangered	Special Concern due to rarity within its range.
Bluehead sucker	<i>Catostomus dicobolus</i>	NA	Special Concern due to habitat loss, predation, & hybridization.
Flannelmouth sucker	<i>Catostomus latipinnis</i>	NA	Special Concern due to habitat loss, predation, & hybridization.
Wonderland Alice-flower	<i>Gilia caespitosa</i>	Candidate	Special Concern due to rarity within its range.
Jones cycladenia	<i>Cycladenia humilis</i> var. <i>jonesii</i>	Threatened	NA
Last chance townsendia	<i>Townsendia aprica</i>	Threatened	Special Concern due to rarity within its range.
Maguire daisy	<i>Erigeron maguirei</i>	Threatened	Special Concern due to rarity within its range.
Mexican spotted owl	<i>Strix occidentalis lucida</i>	Threatened	NA
Roundtail chub	<i>Gila robusta</i>	NA	Special Concern due to loss of populations and threats posed by water developments.
San Raphael cactus	<i>Pediocactus despainii</i>	Endangered	NA
Southwestern willow flycatcher	<i>Empidonax traillii extimus</i>	Endangered	NA
Ute ladies'-tresses	<i>Spiranthes diluvialis</i>	Threatened	Special Concern due to rarity within its range.
Winkler cactus	<i>Pediocactus winkleri</i>	Threatened	Special Concern due to rarity within its range.
Wright fishhook cactus	<i>Sclerocactus wrightiae</i>	Endangered	Special Concern due to rarity within its range.
Yellow-billed cuckoo	<i>Coccyzus americanus</i>	Candidate	NA

NA: Not applicable; indicates that a species was not included on a federal or state list during review for this project.

Cultural Resources

Indian Trust Resources: Secretarial Order 3175 requires that any anticipated impacts to Indian Trust Resources from a proposed project or action by Department of the Interior agencies be explicitly addressed in environmental documents. The federal Indian Trust responsibility is a legally enforceable obligation on the part of the U.S. to protect tribal lands, assets, resources, and treaty rights, and it represents a duty to carry out the mandates of federal law with respect to American Indian and Alaska Native Tribes.

No Indian Trust Resources are designated within the Project Area, and no portion of the Project Area is held in trust by the Secretary of the Interior for the benefit of any American Indian tribe or group. Therefore, Indian Trust Resources was dismissed as an impact topic.

Museum Collections: The National Park Service's *Management Policies, 2001* (2000) and Director's Order #28, *Cultural Resource Management Guideline* (1997) require the consideration of impacts on museum collections (historic artifacts, natural specimens, and archival and manuscript material). Prehistoric and historic archeological sites are not expected to be adversely affected by this project. Consequently, no new collections of artifacts are expected. No additional storage space or cataloging efforts will be required. Therefore, museum collections was dismissed as an impact topic in this document.

Cultural Landscapes: Cultural landscapes are defined by the NPS as "a reflection of human adaptation and use of natural resources and is often expressed in the way land is organized and divided, patterns of settlement, land use, systems of circulation, and the types of structures that are built. The character of a cultural landscape is defined both by physical materials, such as roads, buildings, walls, and vegetation, and by use reflecting cultural values and traditions" (Director's Order #28: Cultural Resource Management Guideline).

The area potentially impacted would include the existing roadbank, located along the Fremont River. There are no known structures located with the project area and the area does not encroach upon the Fruita Historic District. SR-24 itself is not a historic resource, as it was not historically a main route of travel in the area, nor does it meet the 50-years-or-older guidelines. Therefore, Cultural Landscapes was dismissed as an impact topic.

Historic Structures and Buildings: The National Historic Preservation Act, as amended in 1992 (16 USC 470 *et seq.*); the National Environmental Policy Act of 1969 (42 USC 4321 *et seq.*); and the NPS Director's Order #28, *Cultural Resource Management Guideline* (1997), *Management Policies, 2001* (2000), and Director's Order #12, *Conservation Planning, Environmental Impact Analysis, and Decision Making* (2001) require the consideration of impacts on historic structures and buildings listed in or eligible for listing in the National Register of Historic Places. Because there are no structures that would be affected by the Proposed Action, historic structures/buildings was dismissed as an impact topic.

ALTERNATIVES CONSIDERED

This section describes the Proposed Action and the No Action Alternative in detail. The goal of comparing the Proposed Action with the No Action Alternative, as stated in the regulations, is to “present the environmental impacts of the proposal and the alternatives in comparative form, thus sharply defining the issues and providing a clear basis for choice among options by the decision maker and the public” (40 CFR 1502.14).

PROJECT BACKGROUND

SR-24 was completed along the Fremont River through Capitol Reef National Monument in 1962, nine years before Capitol Reef National Park was established. SR-24 is a Function Class I Roadway with an average daily traffic (ADT) >350, and approximately 13 miles pass through the Park. The road represents the only all-weather route through the Park, and the only east-west road in the immediate region. SR-24 connects the towns of Torrey, west of the Park, and Caineville and Hanksville, east of the Park. As outlined in the original 1962 cooperative agreement, UDOT is responsible for maintaining the highway. The natural character of the lands within the road corridor is preserved to the extent possible, and SR-24 provides view areas, parking areas, and serves as the main access route to the Park.

As SR-24 is constructed along the Fremont River, which lies in a deeply incised canyon characterized by alluvial soils, it is prone to the effects of erosion and flooding. The Fremont River flows averaged approximately 26 cubic feet per second (cfs) on August 22 and 140 cfs on August 24, 2003. On the day of the flood, August 23, flows averaged approximately 450 cfs, with peak flows reaching approximately 6,800 cfs. During the last major flood event, in 1984, the peak flow measured approximately 8,000 cfs. The August 23, 2003 flood washed out a portion of the roadway in the area of site 1, and emergency repairs and bank stabilization measures were taken.

The August 23, 2003 flood damaged portions of the road through the park, deposited debris, and forced the closure of SR-24 at the site 1 location while emergency maintenance actions took place. Severe streambank erosion is evident at 12 sites. Emergency repairs ensued to reopen SR-24, but these emergency repairs are short-term in design and do not include aesthetic components to retain or improve the natural setting. In an effort to repair current damages, improve the safety of the road, safeguard against future erosion damage, and reclaim and improve the natural setting, NPS and UDOT is proposing to fortify the road banks along the river at the 12 sites (Figure 2).

THE NO ACTION ALTERNATIVE

The No Action Alternative would result in the continuation of existing road maintenance activities and would not involve any planned repair work on SR-24. Under this alternative, emergency repairs and road maintenance would continue in the event of future erosion damage. The natural setting of the corridor would remain as it is currently, and future habitat degradation would most likely result if future emergency maintenance actions were taken.

THE PROPOSED ACTION

The Proposed Action would include installing erosion control/bank stabilization measures at 12 identified sites along the Fremont River. Construction activities would include removing streambank material, placing erosion control/bank stabilization structures, and restoring the area to a natural setting.

Various erosion control/bank stabilization methods would be used for the Proposed Action. They include bendway weirs, armored embankment, boulder toe protection, and windrow revetment. These methods, which are described in more detail below, are recommended based on characteristics of the Fremont River along SR-24. These four methods were selected because of their functionality, simple construction and maintenance qualities, minimization of construction impacts, ability to augment riparian and aquatic habitat, and aesthetic nature. Each of the four methods may be used exclusively or combined with any other of the four methods, depending on the desired effect and each site's situation. A short description of each method follows, with more detailed descriptions and preliminary design drawings included in Appendix B. Also included in Appendix B are descriptions of the erosion control measures to take at each site, showing site-specific applications of each erosion control measure.

Bendway weirs. Bendway weirs, sometimes referred to as stream barbs, are rock structures placed within the river that force flows away from the riverbank. They can be used at all bend locations requiring stream stabilization and bank line reclamation. Bendway weirs induce sediment deposition along riverbanks and can improve aquatic habitat. They are considered aesthetic and can easily be constructed. While they are an effective means of stabilizing a channel bend, they provide little bank protection during high flow events. Bendway weirs are designed so high flows pass over them.

Bendway weirs are placed so that outer bank flows are redirected towards the center of the channel, reducing near-bank velocities. Sediment deposition is induced along the bank line, and a small scour hole is created immediately downstream of the end of the weir. These attributes improve habitat for aquatic species.

Armored embankment. An armored embankment is a channel bank or bank line that has been regraded and protected by the placement of riprap. They can be used at locations that are experiencing lateral movement and have available space. This method is a durable and effective means of controlling horizontal channel migration. Installation of an armored embankment requires the removal of substantial bank material. Placing soil on top of the riprap and planting native streamside vegetation, such as shrubs and trees, can yield a stable and natural appearing channel bank.

Embankment armoring consists of placing riprap material along a regraded riverbank. Flow along the bank line interacts with a layer of riprap rather than the soils comprising the riverbank, inhibiting lateral channel migration. A 3:1 rock to soil mixture is used for the riprap, which aids revegetation. Once the riprap is in place, soil is placed over the structure and native plants are planted.

Boulder toe protection. Boulder toe protection inhibits lateral channel migration by placing large boulders along the toe of the existing riverbank. It is typically used in locations having larger bend radii and where channel incision is minor to moderate. This method is quickly installed and reduces the erosive forces acting on the bank line. The existing channel bank can be maintained and allowed to naturally degrade in slope over time. Channel bends with deep flows or with steep and abrupt drop-offs are not protected very well with this method.

Boulder toe protection is installed by placing large boulders along the outer channel bend. Proper placement is crucial, as improper placement or improper boulder sizes could speed erosion effects at the bank.

Windrow revetment. Windrow revetment is a rock filled trench that is allowed to be undermined by the river. It can be used wherever adequate space is available for allowing the

river to naturally migrate. While all previous methods require working within the river channel, this method does not.

Installation includes digging a trench away from the river, deep enough so that it is below the bottom of the channel. Riprap is placed into the trench. As with the armored embankment method, a 3:1 rock to soil ratio is used. The trench is covered with soil and replanted. The river is allowed to migrate towards the trench. Once it reaches the trench, its natural cutting action will undercut the revetment, causing the riprap to fall into the stream channel. There, the riprap acts as a barrier to continued stream migration.

There are 12 sites where it has been determined that erosion control/bank stabilization measures may be required. A description of each site is included in Appendix B, while Figure 2 maps each site. In the description of each site, the specific erosion control/bank stabilization measures most applicable to each site are presented.

MITIGATION

The following mitigation measures have been incorporated into the Proposed Action in an effort to avoid or minimize potential project-related impacts.

UDOT would work closely with Park resource managers and personnel throughout all phases of construction. Should construction activities unearth previously undiscovered cultural resources, work would be stopped in that area. Coordination with the Park Cultural Resource Program Manager, the SHPO, and the Advisory Council on Historic Preservation, as necessary, would occur, according to 36 CFR 800.13, *Post Review Discoveries*. In the unlikely event that human remains are discovered during construction, provisions outlined in the Native American Graves Protection and Repatriation Act of 1990 would be followed.

As construction activities would occur within the Fremont River channel, the Army Corps of Engineers (Corps) would be consulted and a Section 404 Permit acquired, as necessary. Construction activities would ensue per the permit and Corps requirements.

Native soil would be placed over armored embankment measures. This would fit the erosion control measure in with the surroundings and would provide a good medium for seed and mulch. Armored embankment treatments would include appropriate plantings, such as willow and/or cottonwood, to augment the natural surroundings and help protect the slope from erosion.

Revegetation that is part of the proposed bank stabilization/erosion control action would use native species from genetic stocks originating in the Park, or from plants previously removed from the construction area whenever possible. If genetic stocks and/or previously removed vegetation are not available, then the same plant species will be used. Revegetation efforts would be designed to reconstruct the natural spacing, abundance, and diversity of native plant species. All disturbed areas would be restored as nearly as possible to natural conditions following completion of the construction project. Subsequent to project completion, Park staff would monitor and require removal of any invasive species observed.

Construction areas would be identified by and fenced with construction tape, snow fencing, or some similar material prior to any construction activity. The fencing would define the construction zone and confine activity to the minimum area required for construction. All protection measures would be clearly stated in the construction specifications, and workers would be instructed to avoid construction activities beyond the construction zone, as delineated

by the construction zone fencing. Construction materials would be stored in previously disturbed areas.

Construction vehicles could leak fluids into the soil, introduce noise pollution, and emit pollutants to the atmosphere. To minimize this possibility, equipment would be checked frequently to identify and repair any leaks, mufflers would be checked for proper operation, and only equipment that is within proper operating specifications would be used.

Construction activities could introduce dust to the atmosphere. To minimize this possibility, best management practices for dust control, such as covering piles of excavated material with fabric and using water to limit dust during excavation activities, would be used.

Traffic delays could occur during construction activities. Construction activities would be timed to minimize impacts to traffic flows. Construction activities would not take place during periods of high Park visitation, which typically occur during the months of April and September. During construction activities, traffic flows and safety will be maintained by keeping construction equipment as far off SR-24 as possible and by providing flag bearers to assist traffic negotiating through construction areas.

ALTERNATIVES CONSIDERED AND DISMISSED

Other alternatives considered and dismissed included constructing a new transportation facility and altering the existing SR-24 to an above-grade facility all along the Fremont River. Construction of a new transportation facility was deemed infeasible because of extensive right-of-way and funding concerns. Likewise, elevating the existing SR-24 above grade was deemed infeasible because of right-of-way, constructability, and funding issues.

Each different erosion control/bank stabilization measure was considered for each site. Through collaboration between NPS, UDOT and Utah resource agencies, the recommended specific erosion control/bank stabilization measures were identified and are presented in Appendix B. Once appropriate action was identified for a particular site, no other alternatives were considered for that site, except for the No Action Alternative, for this EA.

ENVIRONMENTALLY PREFERRED ALTERNATIVE

The Environmentally Preferred Alternative is determined by evaluating the Proposed Action in terms of the CEQ regulations. The CEQ provides that “the environmentally preferable alternative is the alternative that will promote the national environmental policy as expressed in NEPA’s Section 101:

Fulfill the responsibilities of each generation as trustee of the environment for succeeding generations;

Assure for all generations safe, healthful, productive, and aesthetically and culturally pleasing surroundings;

Attain the widest range of beneficial uses of the environment without degradation, risk of health or safety, or other undesirable and unintended consequences;

Preserve important historic, cultural and natural aspects of our national heritage and maintain, wherever possible, an environment that supports diversity and variety of individual choice;

Achieve a balance between population and resource use that will permit high standards of living and a wide sharing of life's amenities; and

Enhance the quality of renewable resources and approach the maximum attainable recycling of depletable resources.”

As evaluated against the CEQ regulations, the Proposed Action is the Environmentally Preferred Alternative. The No Action Alternative represents the current practice of performing emergency repairs after flood events, should any be necessary. This alternative would not uphold the NPS mandate to administer and protect the Park for the enjoyment of natural, cultural, and scientific resources in a manner that leaves these resources unimpaired, while maintaining SR-24 as a safe major central Utah highway. Fortifying the SR-24 roadbanks along the Fremont River would prevent future damages of the scale seen as a result of the August 23, 2003 flood. Preventative measures would negate the need for emergency repairs, which are often unsightly in the Park, do not augment natural habitats, and in most cases harm natural habitats. In this light, the Proposed Action has the potential to benefit resource management in the Park. Specifically, the Proposed Action would improve the safety of SR-24 for commuters and Park visitors and guard against future failing. Concurrently, the Proposed Action would repair damage realized from the recent flood event and improve and/or restore natural habitats along the Fremont River.

The Environmentally Preferred Alternative is the Proposed Action because it surpasses the No Action Alternative in realizing the full range of national environmental policy goals as stated in §101 of NEPA. Through mitigation strategies, the Proposed Action provides a high level of protection of natural and cultural resources while supporting the transportation requirements of SR-24. The Proposed Action also improves habitats along the Fremont River, which would result in a more natural setting and pleasing experience for Park visitors.

SUMMARIES/COSTS

The following three tables provide a comparative summary of the Proposed Action and the No Action Alternative and related impacts.

Table 2. Methods Each Alternative Uses to Ensure Each Objective is Met		
Objective	No Action Alternative	Proposed Action
1. Provide for Protection and enjoyment of natural, cultural, and scientific resources.	Future erosion damage could occur and emergency actions that may negatively impact habitat and natural setting may be required. This would not be protective of resources, nor would it contribute to enjoyment of resources.	Habitat and natural setting would be enhanced through repairing flood damage. Improved bank stabilization would preserve the enjoyment of the natural environment by safeguarding against future erosion/flood damage.
2. Maintain the safety of SR-24, a major central Utah highway.	Future erosion may further degrade the roadbank and result in damage to SR-24, negatively impacting roadway safety.	By repairing existing damage and implementing protection structures/strategies, the current safety of SR-24 would be improved and maintained in the future.
3. Provide for improvement of habitats along the Fremont River.	Allows natural forces to take place to the point where SR-24 would be damaged. At that point, emergency procedures would take place to maintain safety of SR-24. Habitat loss associated with erosion and emergency procedures would not be actively reclaimed, resulting in a net loss in habitat.	Repairs damages due to recent emergency procedures and augments natural habitats through innovative bank structure placement and revegetation actions. Provides protection against future erosion/flood episodes, which allows established habitats to fully develop.

Table 3. Comparison of Alternatives	
No Action Alternative	Proposed Action
No work beyond the current emergency procedures would occur. The streambanks would not be stabilized.	Streambanks would be stabilized and measures to control and/or inhibit future erosion would be installed, lessening the future necessity of emergency actions.
No habitat improvement actions would be taken.	Stabilization techniques that highlight and blend in with the natural aesthetics of the area would be used. Habitats along the Fremont River would be improved from their current state.

Table 4. Summary Comparison of Impacts		
Impact Topic	No Action Alternative	Proposed Action
Visitor Use and Enjoyment	The unnatural setting associated with the emergency maintenance procedures would remain in its current condition. Since future erosion would not be controlled or managed, the threat of further damage to SR-24 is present. Long-term moderate adverse impacts would result.	The Proposed Action would remove unsightly maintenance measures in favor of more effective and natural options. Habitats along the Fremont River would be improved. Short-term minor adverse impacts due to construction activities would occur. Long-term, moderate beneficial effects would occur.
Biotic Communities	The biotic communities damaged from the flood and emergency maintenance actions would not be reclaimed. The disturbed areas may not recover and future damage may result. Long-term adverse minor to moderate impacts would occur.	The Proposed Action would reclaim lost biotic communities and improve habitats along the Fremont River. Short-term minor adverse impacts due to construction activities would occur and long-term moderate beneficial effects would be realized.
Soundscape	More frequent short-term minor adverse impacts would occur due to more frequent emergency maintenance actions and more frequent roadway maintenance. This would result in long-term minor adverse impacts.	The Proposed Action would result in short-term minor adverse impacts due to construction activities. Over the long-term, however, noise would not be above that which is currently experienced.
Soils	Damaged soils would not be reclaimed. The altered areas of the streambanks would not be restored to a natural setting, and the potential of more serious erosion would exist. Minor adverse short and long-term impacts would occur.	The Proposed Action would remove soils placed as emergency maintenance actions. During construction of selected erosion control measures, excavated soil would be retained and replaced such that the natural conditions are preserved. Negligible adverse short-term impacts and minor to moderate beneficial long-term effects would occur.
Visual and Aesthetic Resources	This alternative would not remove the unsightly and unnatural emergency maintenance actions. Moderate adverse impacts in the short and long term would occur.	The Proposed Action would remove the emergency maintenance actions and install erosion control measures that blend and augment the natural visual and aesthetic resources. Construction activities would result in short-term minor adverse impacts and long-term beneficial moderate effects.

Table 4. Summary Comparison of Impacts		
Impact Topic	No Action Alternative	Proposed Action
Archeological and Ethnographic Resources	The potential for repeated road maintenance activities and emergency maintenance actions would result in minor to moderate adverse short and long-term impacts.	Construction activities associated with the Proposed Action would occur according to agreements reached through coordination with SHPO and NPS and would avoid construction outside of areas addressed in coordination. Negligible to minor adverse impacts in the short and long term would result.
Water Resources	Sedimentation of the Fremont River would increase if the existing emergency maintenance actions are not improved. More frequent streambank stabilization activity may be required with this scenario. This would result in adverse moderate impacts in the short and long-term.	The Proposed Action would be subject to mitigative conditions of a §404 permit. Adverse minor short-term impacts would result.

Costs associated with the Proposed Action depend largely on the location of supplies. These costs include the price of the materials and the costs associated with transporting materials to the project site. During agency scoping and coordination meetings, a potential riprap source was identified. This source exists on private property south of SR-24 along the Notom Road, outside of the Park boundaries. The Proposed Action would be funded solely by Utah State funding, and UDOT has the necessary funds available in its operating budget.

AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

Potential project-related impacts are described in terms of type (beneficial or adverse), context (site-specific, local, or regional), duration (short-term or long-term), timing (e.g., seasonal), and intensity (negligible, minor, moderate, or major). Because definitions of intensity vary by impact topic, intensity definitions are provided separately for each impact topic analyzed in this EA.

Additionally, the NPS Management Policies (NPS 2001b) require analysis of potential effects to determine whether or not actions would impair Park resources. Impairment is defined as an impact that, in the professional judgment of the responsible NPS manager, would harm the integrity of Park resources or values. An impact to any Park resource or value may constitute impairment, but an impact would be more likely to constitute impairment to the extent that it has a major or severe adverse effect upon a resource or value whose conservation is:

- Necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park;
- Key to the natural or cultural integrity of the park or to the opportunities for enjoyment of the park; or
- Identified as a goal in the park's General Management Plan (GMP) or other relevant NPS planning document.

The fundamental purpose of the National Park System, established by the Organic Act of 1916 and reaffirmed by the General Authorities Act of 1970, as amended, begins with a mandate to conserve park resources and values. NPS managers must avoid, or minimize to the greatest degree practicable, adversely impacting park resources and values. NPS managers are given the authority to decide if or when impacts to park resources are necessary and appropriate; however, the impact may not constitute an impairment unless a particular law directly and specifically provides otherwise.

Under the Proposed Action, impairment of park resources could result from NPS management or visitor activities or activities undertaken by facility users, contractors, or others operating in the Park. Determinations on impairment are made in the Environmental Impacts sections for Biotic Communities, Noise and Congestion, Soils, Visual and Aesthetic Resources, Archeological Resources, and Water and Floodplain Resources.

CUMULATIVE IMPACT SCENARIO

The CEQ regulations, which implement NEPA, require assessment of cumulative impacts in the decision-making process for federal projects. Cumulative impacts are defined as “the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions” (40 CFR 1508.7). Cumulative impacts are considered for both the Proposed Action and the No Action Alternative.

Cumulative impacts were determined by combining the impact of the alternatives with other past, present, and reasonably foreseeable actions at the Park. Reasonably foreseeable actions along SR-24 include road maintenance operations. There are no major road maintenance operations forecast for this stretch of SR-24; however, regular maintenance actions, such as snow removal, asphalt patching, and rock removal would occur as necessary. As SR-24 serves as the main access road to the Park, any foreseeable projects that would increase visitorship are

considered in cumulative analysis. Reasonably foreseeable actions at the Park that would increase visitorship include the development of the Sleeping Rainbow Ranch as an educational facility (NPS, 2004). This project would likely result in increased visitorship at the Park in order to participate in educational programs at the Sleeping Rainbow Ranch. Since maintenance activities effect SR-24 directly and the development of the Sleeping Rainbow Ranch would likely increase traffic along SR-24, these were considered in the cumulative impacts analysis.

GENERAL METHODOLOGY FOR ESTABLISHING IMPACT THRESHOLDS AND MEASURING EFFECTS

National Parks are directed to assess the extent of impacts to park resources in terms of context, duration, intensity, and timing of the affect. The first step in this process was to further define issues and concerns (as presented in the purpose and Need for the Proposed Action) and to assess the various alternatives given the context, duration, and intensity of effects on Park resources. For each impact topic, thresholds were established to help understand the severity and magnitude of changes in resource conditions, both adverse and beneficial, from the various alternatives.

When baseline inventory data became available for each resource, the effect of a given action upon each resource was measured as the degree of change from the baseline. This change from the baseline was used as an indicator. In the absence of quantitative information, best professional judgment was applied. Existing literature, federal and state standards, and consultation with resource specialists and appropriate agencies corroborated the impact thresholds.

In addition to helping establish impact thresholds, the Park's resource management objectives and goals were integrated in the impact analysis. To further define resource protection goals, the Park's GMP was used to ascertain the "desired future condition" of resources over the long term. The impact analysis then considered whether each alternative contributed to the Park's achievement of its resource goals, or would impede the achievement of these resource goals.

Both the Proposed Action and the No Action Alternative have been evaluated for their effects on the resources and values identified during the scoping process, and impact topics were developed. For each impact topic, impacts are defined in terms of context, intensity, duration, and timing. Direct, indirect, and cumulative effects are discussed in each impact topic. Definitions of intensity levels varied by impact topic, but for all impact topics, the following definitions applied:

Beneficial: A positive change in the condition or appearance of the resource or a change that moves the resource toward a desired condition.

Adverse: A change that moves the resource away from a desired condition or detracts from its appearance or condition.

Direct: An effect that is caused by an action and occurs in the same time and place.

Indirect: An effect that is caused by an action but is later in time or farther removed in distance, but is still reasonably foreseeable.

Short-term: An effect that within a short period of time would no longer be detectable as the resource is returned to its original condition or appearance. The time period associated with short-term may vary by topic.

Long-term: A change in a resource or its condition that does not return the resource to original condition or appearance and for all practical purposes is considered permanent.

Cumulative: The impact on the environment that results from the incremental impact of the action when added to other past, present, foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes other actions (40 CFR 1508.7).

POTENTIAL IMPACTS TO RESOURCES FROM THE PROPOSED ACTION AND THE NO ACTION ALTERNATIVE

Visitor Use and Enjoyment

Affected Environment. The project area is located along SR-24, between the highway and the Fremont River. As the main road in the Park, SR-24 experiences visitor traffic and affords access to several scenic viewing areas and other attractions throughout the Park. Most of these attractions are located away from the project area and SR-24 serves as an access road. However, visitor parking areas are located in close proximity to the project area. On average, the Park sees its heaviest visitor use during the months of April and September.

Methodology. Park visitation patterns, as determined from discussions with UDOT and Park staff and resource managers, were used to estimate the effects of the two Alternatives. Site visits assisted in the analysis of potential impacts on the ability of visitors to experience the full range of park resources along SR-24. The following definitions have been used to define intensity levels:

Negligible: Visitors would not be affected or changes in visitor use and/or experience would be below or at the level of visitor detection. Any effects would be short-term.

Minor: Changes in visitor use and/or experience would be detectable, although the changes would be slight and likely short-term.

Moderate: Changes in visitor use and/or experience would be readily apparent. Visitors would likely form and possibly express an opinion about the changes. Changes would likely be long-term.

Major: Changes in visitor use and/or experience would be readily apparent and have important long-term consequences. The visitor would likely express a strong opinion about the changes.

Impacts of the No Action Alternative

The No Action Alternative entails conditions continuing in their present state. The habitat loss experienced as a result of emergency maintenance procedures taken in August 2003 would continue to be a noticeable detraction from the natural environment setting along the Fremont River, negatively impact visitor enjoyment. Furthermore, if erosion control methods were not implemented, the future safety of SR-24 would be uncertain, as the Fremont River is encroaching on the highway. As erosion trends would be expected to continue, roadway safety would suffer, resulting in traffic congestion and/or car accidents. Visitorship may decline, as would enjoyment, if this scenario occurs. In the event of future failures, more emergency maintenance actions would be taken. Overall, impacts to visitor use would be adverse and moderate in the long-term.

Cumulative effects: Reasonably foreseeable actions at the Park would likely result in increased Park visitorship, meaning increased traffic along SR-24. Without installing erosion control/bank

stabilization measures, roadway safety would deteriorate and, coupled with congestion due to increased visitorship, roadway safety would deteriorate at a greater rate as time progresses. Overall, the effects of this alternative, coupled with other effects on visitor use in the project area, would result in both short and long-term minor to moderate impacts on visitor use and enjoyment.

Conclusion: Habitats along the Fremont River and the safety of SR-24 would not improve and would potentially worsen. As a result, impacts to Visitor Use and Enjoyment would be adverse and moderate in the long-term.

Impacts of the Proposed Action

Impacts to Visitor Use and Experience in the vicinity of the project area would be adverse and minor in the short-term and beneficial and moderate in the long-term. Short-term minor traffic delays and the sight of construction activities in close proximity to the Fremont River would detract from visitor enjoyment. Strategies to mitigate for these impacts would include performing construction activities during low visitation times and posting information about the project in the visitor center. In the long-term, the improved habitats and natural settings accomplished through the selected erosion control/bank stabilization methods would result in increased visitor enjoyment because of the more natural setting along SR-24. Additionally, the erosion control methods selected would inhibit river encroachment on SR-24, preventing structural failure of the roadway and keeping traffic flowing safely through the Park.

Cumulative effects: The Proposed Action, which would improve safety and habitats along SR-24, would be able to serve increased visitor traffic levels and provide a more natural visitor experience. The Proposed Action would reduce adverse long-term cumulative impacts. Overall, the effects of the Proposed Action, along with other effects on visitor use in the project area, would result in short and long-term minor impacts on visitor use.

Conclusion: Impacts to Visitor Use and Enjoyment in the area along the Fremont River would be adverse and minor in the short-term and beneficial and moderate in the long-term.

Biotic Communities

Affected Environment. Riparian and aquatic habitat types exist in the vicinity of the project area. These habitat types include plants such as willows, cottonwoods, ashes, some grasses, and forbs. These habitats provide support to wildlife such as migratory birds, squirrels and chipmunks, beavers, raccoons, coyotes, some lizards, and deer. Wildlife use these habitats for a variety of purposes: shelter, cover and concealment, forage, and nesting/roosting sites. Additionally, these habitats provide cover and support food sources utilized by aquatic wildlife, such as fish and amphibians. Erosion, the flood event of August 23, 2003 and the subsequent emergency maintenance actions adversely affected these habitats by washing out and destroying plants and the soils that support these plants. The resultant lack of plants results in a higher potential of soil erosion into the river, further degrading aquatic habitats.

Methodology. The impacts on the biotic communities were assessed according to the thresholds defined below:

Negligible: No native vegetation or wildlife populations would be affected, even though some individuals may be temporarily displaced. The effects would be short-term (recovering in less than 1 year for animals and 3 years for plants) and on a small scale.

Minor: Some individual native plants and animals would be affected, as would a relatively minor portion of that species' population. Mitigation to offset adverse effects could be required and would be effective.

Moderate: Some individual native plants and animals would be affected. A sizeable segment of the species' population in the long-term over a relatively large area would also be affected. Mitigation to offset adverse effects could be extensive, but would likely be successful.

Major: Considerable long-term effects on native plant or animal populations over a large area would be affected. Mitigation measures to offset the adverse effects would be required and extensive, and success of the mitigation measures would not be guaranteed.

Impacts of the No Action Alternative

In the short-term, the biotic communities that were damaged by erosion, the flood, or the emergency maintenance actions would continue to be adversely affected because habitat restoration activities would not occur. In the long-term, the habitats along the Fremont River would not be improved and they would be susceptible to further damage from erosion, potential floods, and potential emergency maintenance actions. Impacts to biotic communities with the No Action Alternative would be adverse and moderate both in the short-term and long-term.

Cumulative Effects. Plants and animals in the project area are subject to damage from natural processes, visitor access, roadway interference, and vandalism. The flood event and ensuing emergency maintenance measures resulted in the displacement and loss of some biotic resources along the Fremont River. As SR-24 is a major highway in central Utah, measures will be taken to ensure its viability as a safe highway. For the No Action Alternative, no construction of erosion control/bank stabilization measures would occur, which would result in the use of emergency maintenance actions in the future. This would disturb biotic communities along the Fremont River. These emergency actions, in combination with the effects of natural processes, visitor access, roadway interference, and vandalism on biotic communities, would result in cumulative adverse minor to moderate impacts to biotic communities.

Conclusion. The No Action Alternative would result in adverse minor to moderate long-term impacts to biotic communities along the Fremont River.

Impairment Determination. Because there would not be adverse major long-term impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the Park; 2) key to the natural or cultural integrity of the Park or to opportunities for enjoyment of the Park; or 3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would not be impairment of the Park's resources or values with respect to Biotic Communities.

Impacts of the Proposed Action

Construction activities associated with the Proposed Action would necessitate removal of soil and plants located at the project sites. However, these areas were disturbed previously by scouring action associated with erosion and the flood and as a result of emergency maintenance actions taken. During construction activities, wildlife that utilize the areas would be displaced or prevented from using the resources of the area. These impacts would be localized and limited to the immediate area of the project site, however. Upon completion of constructing erosion control/bank stabilization measures, vegetation would be restored to a condition better than its current state at the project sites. Aquatic habitats would be improved through the installation of

bendway weirs at some locations and through vegetation placed along the bank at the project sites. Impacts to biotic communities would be minor and adverse in the short-term and moderate and beneficial in the long-term.

Cumulative Effects. If the Proposed Action were taken, future emergency maintenance measures, which disrupt biotic communities, would be less likely. A component of the Proposed Action is to improve the biotic communities that were damaged in the August 23, 2003 flood and resultant emergency maintenance measures. Overall, the effects of the Proposed Action, combined with the effects of other actions in this area, would result in long-term cumulative minor adverse impacts to biotic communities. The Proposed Action would contribute mostly beneficial impacts over time.

Conclusion. Since construction activities associated with the Proposed Action would take place in previously disturbed areas, the Proposed Action would result in minor adverse impacts to biotic communities in the short-term. Since habitat improvements are included as part of the Proposed Action, the Proposed Action would result in moderate beneficial impacts to biotic communities in the long-term at the 12 project sites. Impacts to biotic communities would be minor and adverse in the short-term and moderate and beneficial in the long-term.

Impairment Determination. Because there would not be major, adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the Park; 2) key to the natural or cultural integrity of the Park or to opportunities for enjoyment of the Park; or 3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's resources or values with respect to Biotic Communities.

Soundscape

Affected Environment. The project area is located at 12 specific sites along SR-24, between the highway and the Fremont River. As the main road in the Park, SR-24 experiences Park and state highway traffic. The associated noise from traffic, however, is not great, as this area is a rural area of Utah. The Fremont River, which runs along SR-24, is audible at each of the 12 sites. Also audible at each of the project sites are the sounds of wildlife, such as songbirds.

Methodology. Impacts on the soundscape were assessed according to the thresholds below:

Negligible: Changes to the soundscape would not be noticeable from the surrounding landscape. The change would be so small that it would not alter the experience for Park visitors.

Minor: Changes to the soundscape would be small, of short duration or intermittent, and localized, yet detectable by visitors within the surrounding area.

Moderate: Changes to the soundscape would be detectable within the surrounding landscape and would be of lengthy duration or constant. These impacts would affect more than one site, limit wildlife use, or alter the experience of visitors to the area.

Major: Changes to the soundscape would be dramatic, detrimental to visitation, of lengthy duration or constant, widespread, and/or very apparent, possibly completely altering the experience of Park visitors.

Impacts of the No Action Alternative

Road maintenance activities would continue for the No Action Alternative. Types of maintenance activities might include maintenance of emergency measures taken after the 2003 flood and more emergency maintenance measures as a result of future floods. These activities would impact the Park's soundscape with the noise related to construction equipment. These impacts would be adverse and minor with a short-term duration. However, they may occur more often if the No Action Alternative is taken. Mitigation measures for future actions for this alternative may include using well-maintained equipment with proper noise-arresting devices installed. The timing of emergency actions could not be controlled and might occur during the highest visitor use times or more sensitive times for wildlife.

Cumulative Effects. The soundscape at the Park is defined by visitor use patterns, park operations, park construction activities, and natural processes. The No Action Alternative would increase noises associated with construction activities for short durations, but possibly at a more frequent interval. Reasonably foreseeable actions at the Park, such as the development of the Sleeping Rainbow Ranch as an Educational Facility (NPS, 2004), could also increase noise, due to construction, although they would be minor and short-term. Increased traffic noise associated with increased visitorship as a result of the development of the ranch would be long-term and minor. Overall, impacts of the No Action Alternative, along with the other actions that impact the soundscape, would result in more frequent short-term adverse and minor impacts to the soundscape experienced at the Park by visitors and wildlife alike.

Conclusion. Because of increased noise associated with increased visitorship associated with the Sleeping Rainbow Ranch, more frequent road maintenance activities, and more frequent emergency maintenance actions, noise impacts along SR-24 would be minor and adverse in the short and long-term.

Impacts of the Proposed Action

Construction activities at the project sites would cause short-term noise increases. Equipment causing these impacts would be heavy equipment, such as backhoes, bulldozers, and dump trucks. These impacts would be most noticeable in the same area as where the construction activities are occurring and may reach into the 80-90 decibel (dB) level. However, these impacts would be less noticeable as the distance from the area where construction activities are occurring increases, because noise decreases by approximately 3 dB for every doubling of distance from the source. Mitigation measures to limit these impacts include using well-tuned construction equipment with properly operating mufflers and performing work during low visitation periods.

Cumulative Effects. The Proposed Action would increase noise associated with construction activities for short durations. Overall, the short-term effects of the Proposed Action, in conjunction with other sources of noise in the Park, would result in minor adverse cumulative impacts to the soundscape. The Proposed Action would not contribute to long-term cumulative effects of the other actions that impact the soundscape.

Conclusion. Noise along SR-24 would increase and adverse impacts would be minor and short-term due to construction activities. Over the long-term, no impacts to the soundscape along SR-24 are anticipated.

Impairment Determination. Because there would be no major, adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing

legislation or proclamation of the Park; 2) key to the natural or cultural integrity of the Park or to opportunities for enjoyment of the Park; or 3) identified as a goal in the Park's GMP or other relevant NPS planning documents, here would be no impairment of the Park's resources or values with respect to the soundscape.

Soils

Affected Environment. The project area resides within the floodplain of the Fremont River and the roadbed of SR-24. Soils at each of the project sites primarily consist of roadbase material used in the construction of SR-24. Some soils at the project sites are associated with past erosion control and streambank stabilization measures, however. Any native soils in the areas of the project sites are alluvial.

Methodology. The impacts on soils within the project area were assessed according to the thresholds defined below:

Negligible: Soils would not be affected, or the effects to soils would be below or at the lower levels of detection. Any effects on soil productivity or fertility would be slight, and no long-term effects to soils would occur.

Minor: The effects to soils would be detectable. Effects to soil productivity or fertility would be small, as would the area affected. If mitigation were needed to offset adverse effects, it would be relatively simple to implement and would likely be successful.

Moderate: The effect on soil productivity or fertility would be readily apparent, likely long-term, and result in a change to the soil character over a relatively wide area. Mitigation measures would probably be necessary to offset adverse effects and would likely be successful.

Major: The effect on soil productivity or fertility would be readily apparent, be long-term, and substantially change the character of the soils over a large area in and out of the park. Mitigation measures to offset adverse effects would be needed and extensive, but their success would not be guaranteed.

Impacts of the No Action Alternative

Road maintenance activities and natural processes would continue under the No Action Alternative. Future maintenance activities may disturb soils through the maintenance of the existing emergency maintenance measures and potential new emergency maintenance actions. Since no active revegetation actions would be taken in the areas where emergency maintenance measures were taken in 2003, the natural processes of the Fremont River would erode these soils at a quicker rate than has been experienced in the past. Mitigation measures to mitigate soil disturbance due to maintenance activities would include working only within the limits of areas needing action and either replanting vegetation or promoting an environment that would allow native vegetation to take hold. Mitigation measures to mitigate soil disturbance due to the river's natural processes would include continuing to add riprap material to the existing emergency maintenance actions and either replanting vegetation or promoting an environment that would allow native vegetation to take hold. These activities present minor adverse impacts that would be short-term in duration, yet may occur repeatedly, resulting in long-term minor adverse effects.

Cumulative Effects. Soils along SR-24 in the Park are subject to damage from road maintenance activities, natural processes (such as flooding), and visitor access. Past maintenance activities

have resulted in disturbance in the project area. The emergency maintenance actions taken after the August 23 flood placed rocks and soils from the surrounding areas alongside SR-24 to curb ongoing erosion. These emergency actions left the area without vegetation, which is uncharacteristic along the Fremont River. The No Action Alternative would not include any construction in the immediate future. However, because no erosion control/bank stabilization measures would be taken at the current time, future maintenance actions similar to those taken after the August 23, 2003, flood would be likely. The impacts associated with continued and potential emergency maintenance actions; and those associated with natural processes would be additional to regular maintenance soil erosion impacts. The No Action Alternative would contribute to cumulative minor to moderate adverse impacts to soils along SR-24.

Conclusion. Because of increased erosion potential and the lack of rehabilitating streamside habitats, the No Action Alternative would result in frequent minor and adverse short-term impacts, which would result in minor adverse impacts in the long-term.

Impairment Determination. Because there would be no major adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the park; 2) key to the natural or cultural integrity of the Park or to opportunities for enjoyment of the Park; or 3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's resources or values with respect to soils.

Impacts of the Proposed Action

The Proposed Action would entail temporarily disturbing soils at each project site, but these areas are areas that were previously disturbed, as they consist of roadbase material placed during the construction of SR-24 and while installing the emergency controls after the 2003 flood. These disturbances would be negligible, adverse, and short-term. Measures to mitigate for these impacts would include clearly delineating the project site and restricting work to the project site. Disturbance would be associated with construction activities only, as staging areas would be on SR-24, within various parking areas or in the shoulder of the roadway. Measures to mitigate for these impacts would include restricting work to the project site.

The Proposed Action includes revegetation of the soils as part of the bank stabilization work. This would serve to protect the soils and help hold them in place. The soils would become an integral component of the natural environment, a minor to moderate beneficial effect to soils.

Cumulative Effects. The Proposed Action would install various erosion control/bank stabilization measures at the project sites, excavating the emergency maintenance actions in the process. Revegetation would occur as part of bank stabilization. Cumulative adverse impacts to soils would be negligible to minor in the long-term. Implementation of the Proposed Action would not contribute significantly to adverse cumulative impacts of other past and foreseeable actions on soils and would contribute long-term beneficial cumulative impacts.

Conclusion. Soil disturbances due to associated construction activities associated with the Proposed Action would result in negligible adverse short-term impacts. Soil improvements throughout the project area and the prevention of large erosion episodes would result in long-term minor to moderate beneficial effects to soil resources within the project area.

Impairment Determination. Because there would be no major, adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the Park; 2) key to the natural or cultural integrity of the Park or to

opportunities for enjoyment of the Park; or 3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's resources or values with respect to soils.

Visual and Aesthetic Resources

Affected Environment. The project area is located along SR-24, between the highway and the Fremont River. It lies east of the Fruita Historic District and extends to the eastern boundary of the Park. The project sites are characterized by disturbed soils placed as emergency maintenance actions after the flood. These areas are either devoid of vegetation or the vegetation is disturbed, as are the soils. The areas immediately surrounding the project sites consist of habitats natural to the Fremont River banks. They include mature vegetation, such as willows and trees along the banks, which affords serene views of the Fremont River. The viewshed from the highway corridor includes views of the surrounding cliffs and scenic vistas; conversely, the project area can be seen from atop various mesas to which visitors may hike.

Methodology. Impacts on visual and aesthetic resources were assessed according to the intensity thresholds defined below:

Negligible: An action that would not be visible from the majority of the viewshed. The change in the visible landscape would be so small or localized that it would have no measurable or perceivable consequence to the natural surroundings.

Minor: An action that would be visible from the majority of the viewshed but would have characteristics that do not contrast sharply with the surrounding landscape. The change in the visible landscape would be small or localized but it would be measurable in the natural surroundings.

Moderate: An action that would be visible from the majority of the viewshed and would have characteristics that contrast with the surrounding landscape.

Major: An action that would have a substantial impact on the viewshed and would greatly detract from the appearance and enjoyment of the natural surroundings.

Impacts of the No Action Alternative

Road maintenance activities would continue for the No Action Alternative. Types of maintenance activities might include maintenance of emergency measures taken after the 2003 flood and more emergency maintenance measures as a result of future floods. These activities would impact the Park's visual and aesthetic resources by not improving the current viewshed in the project area and by potentially impacting new areas through future emergency maintenance actions. These impacts would be adverse and moderate and short and long-term in duration. Measures to mitigate for these impacts may include informational materials that explain the challenges of maintaining a road alongside a river in a National Park be placed in the visitor's center. Other measures to mitigate these impacts may include planting native vegetation on the in the disturbed soils.

Cumulative Impacts. Visitor use patterns, park operations, UDOT operations, and natural processes influence visual and aesthetic resources in the project area. Past maintenance actions have altered visual and aesthetic resources along SR-24. Foreseeable impacts to visual resources in the project area include future highway maintenance actions and more traffic related to increased visitorship. The No Action Alternative would likely result in maintenance actions

similar to those taken after the August 23 flood. These actions would add to cumulative effects related to other foreseeable actions. Overall, cumulative impacts would be adverse and minor to moderate in the long-term.

Conclusion. The No Action Alternative, because it would continue the current conditions, would have a moderate adverse impact, in the short and long-term, to visual and aesthetic resources.

Impacts of the Proposed Action

Because the erosion control/bank stabilization measures would include revegetation, incorporate soils and rocks from the surrounding environs, and would improve the visual qualities of the project sites, residual adverse impacts to visual resources would be minor and localized, and long-term beneficial effects would occur.

Cumulative Effects. Future highway maintenance actions and continued or increased visitor use can be expected in the future. The Proposed Action would fortify the streambank against further drastic erosion, negating the need of emergency control measures such as those taken after the 2003 flood. Habitat restoration actions of the Proposed Action would present a more natural viewshed to visitors. Overall, implementation of the Proposed Action would not contribute significantly to cumulative impacts of other actions that impact visual and aesthetic resources.

Conclusion. The Proposed Action would improve the visual and aesthetic resources along SR-24 and the Fremont River. These improvements would be noticeable from the highway as well as from various viewpoints from other areas of the Park. These effects would be beneficial and moderate in the long term. In constructing the erosion control/bank stabilization measures, construction activities would result in minor adverse impacts in the short-term.

Archeological and Ethnographic Resources

Affected Environment. The Fremont River is rich in evidence of early civilizations. Surveys have resulted in a full documentation of known resources and are managed by Park resource managers. No known resources are known to exist within each of the 12 project sites; however, discovery of archeological and ethnographic resources is possible. Ongoing consultation with Native groups has revealed the importance of several locations within the Fremont Canyon.

Methodology. Certain important research questions about human history can only be answered by the actual physical material of archeological resources and/or documentation of the significance of resources through ethnographic study. An archeological resource can be eligible to the National Register of Historic Places if the site has yielded, or may be likely to yield, information important in prehistory or history. An archeological finding can be nominated to the National Register in one of three historic contexts: local, state, or national (see National Register Bulletin #15, How to Apply the National Register Criteria for Evaluation). For this particular project, archeological resources and ethnographic resources are the same. For purposes of analyzing impacts to archeological and ethnographic resources, thresholds of change for the intensity of an impact are based upon the potential of the site to yield information important in prehistory or history, as well as the probable historic context of the affected site:

Negligible: Impact is at the lowest levels of detection—barely measurable with no perceptible consequences, either adverse or beneficial, to archeological and ethnographic resources. For purposes of §106, the determination of effect would be no adverse effect.

Minor: *Adverse*: disturbance of a site(s) results in little, if any, loss of significance or integrity and the National Register eligibility of the site(s) is unaffected. For purposes of §106, the determination of effect would be no adverse effect.

Beneficial: maintenance preservation of a site(s). For purposes of §106, the determination of effect would be no adverse effect.

Moderate: *Adverse*: disturbance of a site(s) does not diminish the significance or integrity of the site(s) to the extent that its National Register eligibility is jeopardized. For purposes of §106, the determination of effect would be adverse effect.

Beneficial: stabilization of the site(s). For purposes of §106, the determination of effect would be no adverse effect.

Major: *Adverse*: disturbance of a site(s) diminishes the significance and integrity of the site(s) to the extent that it is no longer eligible to be listed in the National Register. For purposes of §106, the determination of effect would be adverse effect.

Beneficial: active intervention to preserve the site(s). For purposes of §106, the determination of effect would be no adverse effect.

Impacts of the No Action Alternative

There would be no known impacts to archeological and ethnographic resources from the No Action Alternative. Coordination with NPS resource managers, SHPO, and Native Tribes has revealed no archeological and ethnographic resources located within each of the 12 project sites. Under the No Action Alternative, erosive forces of the Fremont River may be stronger in areas where emergency maintenance measures were taken and vegetation was not replanted. This scenario could result in the discovery of new archeological and ethnographic resources due to erosion. If new archeological and ethnographic resources were discovered in such a manner, coordination with the Park Cultural Resource Program Manager, the SHPO, the Advisory Council on Historic Preservation, and Native Tribes, as necessary, would occur, and would limit adverse impacts to negligible to minor levels. With the No Action Alternative, however, future emergency maintenance actions are possible, which may uncover newly discovered archeological and ethnographic resources. Mitigation measures would require coordination with the Park Cultural Resource Program Manager, the SHPO, the Advisory Council on Historic Preservation, and Native Tribes, as necessary. Short and long-term impacts to archeological and ethnographic resources would be minor to moderate and adverse.

Cumulative Effects. Archeological and ethnographic resources at the Park are subject to damage from vandalism, visitor access, and natural processes. Reasonably foreseeable actions, such as road maintenance actions and increased visitorship resulting from the development of Sleeping Rainbow Ranch, would undergo scrutiny relative to archeological resources by the Park Cultural Resource Program Manager, and, if necessary, the SHPO, the Advisory Council on Historic Preservation, and Native Tribes to limit adverse impacts to negligible to minor levels. The No Action Alternative would not impact archeological and ethnographic resources beyond negligible to minor levels in the short-term. However, in the event future emergency maintenance actions are taken, or in the event erosive forces of the river unearth archeological and ethnographic resources, impacts would be minor-to moderate and adverse. Overall, impacts of the No Action Alternative, along with the impacts of other actions that impact archeological and ethnographic resources, would be adverse and minor to moderate.

Conclusion. The possibility of future erosion or future emergency maintenance measures uncovering unknown archeological and ethnographic resources exists. Mitigation strategies would include coordination with the Park Resource Manager. For these reasons, potential adverse impacts to archeological and ethnographic resources would be minor to moderate in the short and long-term.

Impairment Determination. Because there would be no major adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the Park; 2) key to the natural or cultural integrity of the Park or to opportunities for enjoyment of the Park; or 3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's resources or values with respect to archeological and ethnographic resources.

Impacts of the Proposed Action

There would be no impacts to known archeological and ethnographic resources from the Proposed Action. Coordination with NPS resource managers and SHPO has revealed no archeological resources located within the 12 project sites associated with the Proposed Action. If, during construction activities, unknown archeological and ethnographic resources are discovered, work would halt and coordination with the Park Cultural Resource Program Manager, the SHPO, and the Advisory Council on Historic Preservation, and Native Tribes, as necessary, would occur, and would limit adverse impacts to negligible to minor levels. A letter of concurrence from SHPO is included in Appendix A.

Cumulative Effects. The Proposed Action would not impact archeological and ethnographic resources beyond negligible to minor levels. Construction activities associated with the Proposed Action would fortify the streambank against drastic erosion and negate the need of future emergency actions at that spot. For these reasons, the Proposed Action would not add substantially to cumulative impacts on archeological and ethnographic resources.

Conclusion. The possibility of inadvertently discovering archeological and ethnographic resources during actions associated with the Proposed Action exists. If new archeological and ethnographic resources are discovered, coordination with the Park Cultural Resource Manager, Native Tribes, and, if necessary, SHPO would occur. For these reasons, potential adverse impacts to archeological and ethnographic resources would be negligible to minor in the short and long-term.

Impairment Determination. Because there would be no major adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the Park; 2) key to the natural or cultural integrity of the Park or to opportunities for enjoyment of the Park; or 3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's resources or values with respect to archeological and ethnographic resources.

Water Resources, Including Floodplains

Affected Environment. The project area lies along SR-24, between the highway and the Fremont River. It extends east of the Fruita Historic District to the eastern Park Boundary. Water resources within the project area include the Fremont River, a perennial river that lies in a deeply incised canyon characterized by alluvial soils. East of the Park boundaries, the Fremont River joins with the Muddy River to form the Dirty Devil River, which flows into the Colorado River. In the project area, several ephemeral washes and streams drain into it, including Grand

Wash, Spring Canyon, Deep Creek, and Sulphur Creek. According the Utah Division of Water Quality, the Fremont River, within the Park, is ranked as fully supporting its Class 3A (cold-water game fish) beneficial use. Downstream of the Park, the Fremont River is ranked as partially supporting its Class 3A beneficial use, due to low dissolved oxygen and total phosphorous. The Fremont River and its tributaries are considered U.S. waters and thus are bound by §404 of the Clean Water Act. Within the project area, the Fremont River floodplain was altered with the construction of SR-24. Currently, the floodplain encompasses areas extending north of the river, which is outside of the project area, the roadway, and areas south of the roadway, and the ephemeral washes that join the river channel.

Methodology. The impacts on water resources were assessed according to the thresholds defined below:

Negligible: Water resources would not be affected, or changes would be either non-detectable or if detected, would have effects that would be considered slight, local, and short-term. No mitigation measures associated with water resources would be necessary.

Minor: Changes to water resources would be measurable, although the changes would be small, likely short-term, and localized. No mitigation measures associated with water resources would be necessary.

Moderate: Changes to water resources would be measurable and long-term but would be relatively local. Mitigation measures associated with water resources would be necessary and the measures would likely succeed.

Major: Changes to water resources would be readily measurable, would have substantial consequences, and would be noticed on a regional scale. Mitigation measures would be necessary and their success would not be guaranteed.

Impacts of the No Action Alternative

Road maintenance activities would continue for the No Action Alternative. Types of maintenance activities might include maintenance of emergency measures taken after the 2003 flood and more emergency maintenance measures as a result of future floods. These activities would impact the Park's water resources and floodplains through uncontrolled sedimentation and increased impacts to aquatic organisms. Measures to mitigate for these impacts may include utilizing sedimentation controls, such as silt fence, when working on the roadbank and working within the river channel only during low flows. These impacts would be adverse and moderate and short and long-term in duration.

Cumulative Effects. Water resources and floodplains at the Park are subject to damage from visitor access and natural processes. Past development in the Park, such as the construction of SR-24, has resulted in the alteration of the Fremont River and the floodplain. Reasonably foreseeable actions, such as highway maintenance actions and visitor activity, could also affect the river and/or the floodplain. Overall, the moderate adverse impacts of the No Action Alternative, along with the other actions that impact water resources and floodplains, would result in cumulative moderate adverse impacts.

Conclusion. Sedimentation of the Fremont River may result due to erosion or maintenance of the existing emergency maintenance structures. By not improving the emergency maintenance measures installed in 2003, floodplain health is not improved and future emergency actions may be required, which would in turn add to sedimentation of the river. Impacts to water resources

and floodplains for the No Action Alternative would be adverse and moderate in the short and long-term.

Impairment Determination. Because there would be no major adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the Park; 2) key to the natural or cultural integrity of the Park or to opportunities for enjoyment of the Park; or 3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's resources or values with respect to Water Resources.

Impacts of the Proposed Action

The Proposed Action would require construction activities to take place within the river channel and within the Fremont River floodplain. These actions would likely result in contamination of riparian and/or riverine habitats and sedimentation of the Fremont River, which could disturb organisms and raise water temperatures. Because of these reasons, compliance with §404 of the Clean Water Act would be required. The State of Utah holds a current General Permit 40, issued by the COE, which applies if a stream alteration permit is obtained from the State Engineer. This §404 permit would allow for excavation in a stream for bank protection projects and road and bridge construction or repair projects. Conditions of this permit include using fill material that is clean and free of contaminants in toxic quantities, working in low flow periods, and disturbed soils must be revegetated and stabilized. Adherence to the permit would lessen adverse impacts to water resources, including floodplains. Impacts of the Proposed Action would be minor and short-term.

Cumulative Effects. Water resources and floodplains at the Park are subject to damage from visitor access and natural processes. Past development in the Park, such as the construction of SR-24, has resulted in the alteration of the Fremont River and the floodplain. Reasonably foreseeable actions, such as highway maintenance actions and visitor activity, could also affect the river and/or the floodplain. If the Proposed Action were implemented, the erosion control/bank stabilization measures would negate the need of future emergency maintenance actions, thus preventing damage to both the river and the floodplain these actions would cause. Overall, the localized short-term minor adverse and long-term beneficial effects of the Proposed Action, along with the other actions that impact water resources and floodplains, would result in cumulative minor adverse impacts.

Conclusion. Mitigation strategies, such as clearly defining the project site and working only within the project site, using silt fencing to limit sedimentation, and adhering to the conditions of a stream alteration permit would be implemented for construction activities associated with the Proposed Action. With these mitigative strategies in place, short-term, minor, adverse impacts to water resources would result.

Impairment Determination. Because there would be no major adverse impacts to a resource or value whose conservation is 1) necessary to fulfill specific purposes identified in the establishing legislation or proclamation of the Park; 2) key to the natural or cultural integrity of the Park or to opportunities for enjoyment of the Park; or 3) identified as a goal in the Park's GMP or other relevant NPS planning documents, there would be no impairment of the Park's resources or values with respect to Water Resources.

CONSULTATION/COORDINATION

Public Involvement

Public involvement for the preparation of this EA included publication of a notice in April 2004 stating the purpose of the study, identifying the Proposed Action, and soliciting input on aspects of the planning process. The public notice was published in the *Richfield Reaper*, published in Richfield, Utah, and the *Salt Lake Tribune* and the *Deseret Morning News*, each published in Salt Lake City, Utah. Consultation with natural resource agencies and Native American Tribes prior to completion of this EA also occurred. All correspondence related to public involvement and agency coordination is included in Appendix A.

Upon completion of this EA, legal notices were published in the *Richfield Reaper*, *Salt Lake Tribune*, and the *Wayne County Insider*. Copies of the EA were distributed to regional federal, state, and county agencies, media outlets, the local library, and potentially interested Tribal nations and non-government organizations. The list of individuals to whom the EA was sent is available from the Park.

Native American Tribes were initially contacted during the scoping process. The following Tribes were contacted:

Table 5. Native American Groups Notified by Letter of Proposed Action			
Paiute Indian Tribe of Utah	Ute Mountain Ute Tribe	Pueblo of Zuni	White Mesa Ute Tribe
Hopi Tribe	Navajo Nation	Picuris Pueblo	Santa Clara Pueblo
Cochiti Pueblo	San Juan Pueblo	Pueblo of Pojoaque	Pueblo of Acoma
Southern Ute Tribe	Santa Ana Pueblo	Pueblo of Santo Domingo	Pueblo of Zia
Taos Pueblo	Goshute Tribe	Sandi Pueblo	Pueblo of Isleta
Tesuque Pueblo	Pueblo of San Ildefonso	Pueblo of Jemez	Kaibab Paiute
Uintah and Ouray Tribe			

The Hopi Tribe requested additional information that would assist them in determining if this proposal would affect cultural resources significant to the Hopi Tribe. The NPS provided additional information and after further consultation the Hopi Tribe concurred with the NPS assessment of no adverse effect. The Southern Ute Indian Tribe also responded, stating they believed there were no known impacts to cultural resources sensitive to the Southern Ute Indian Tribe as a result of this project.

Consultation with the Utah SHPO, USFWS, the Utah Division of Wildlife, and the Utah Division of Water Rights was conducted as part of the planning effort.

Communication with SHPO was initiated on March 15, 2004. Following consultation the SHPO concurred with the NPS determination of no adverse effect.

The proposed project addressed in this EA requires coordination with the USFWS. On March 1, 2004 the NPS provided a list of federally listed and candidate species that could potentially occur in the project area to the USFWS and sought concurrence that the Proposed Action would not adversely affect listed or candidate species or proposed or designated critical habitat. In a memo dated March 8, 2004, the USFWS concurred that the Proposed Action was “not likely to

adversely affect” any listed species, including Mexican spotted owl individuals, or adversely modify or destroy Mexican spotted owl critical habitat.

The Utah Division of Wildlife was contacted by letter on December 10, 2003 to describe the proposed project and seek comments. The correspondence received from the Utah Division of Wildlife by telephone on January 13, 2004 stated that the DWR had no specific concerns.

The Utah Division of Water Rights was contacted by letter on December 8, 2003, describing the proposed project and seeking comments. A Division of Water Rights reply on December 9, 2003 indicated their concern that methods that accentuated natural systems and aquatic habitats be utilized to the furthest extent possible when designing erosion control/bank stabilization control measures.

List of Preparers and Principal Contributors

Mr. Alex Hildebrand, Environmental Scientist, URS

Ms. Patricia Rothacher, NEPA Specialist, URS

Mr. Robert Clegg, Project Manager, URS

Mr. Kevin Klimeck, Environmental Engineer, URS

Ms. Nancy VanDyke, Technical Review, URS

Mr. Monte Aldridge, Project Manager, UDOT

Mr. Daryl Friant, Environmental Engineer, UDOT

Ms. Susan Miller, Cultural Resources Manager, UDOT

Mr. Albert J. Hendricks, Superintendent, Capitol Reef National Park, NPS

Mr. David Worthington, Biologist, Capitol Reef National Park, NPS

Ms. Anne Worthington, Cultural Resource Program Manager, Capitol Reef National Park, NPS

REFERENCES

National Park Service. 2001a. Record of Decision, Final General Management Plan and Environmental Impact Statement, Capitol Reef National Park, Intermountain Region. Denver, Colorado.

National Park Service. 2001b. National Park Service *Management Policies*. National Park Service, Washington, D.C.

National Park Service. 2004. Development of the Sleeping Rainbow Ranch as an Educational Facility: Environmental Assessment and General Management Plan Amendment. Capitol Reef National Park, Intermountain Region, Denver, Colorado.

National Park Service, Capitol Reef National Park, Cultural Resource Program Manager, personal communication via email with Anne Worthington, regarding archeological and Native American consultation.

Utah Department of Environmental Quality, Division of Water Quality. 2001. *West Colorado Watershed Management Unit Water Quality Assessment*. Utah Department of Environmental Quality, Salt Lake City, Utah.

Utah Department of Environmental Quality, Division of Water Quality. 2002. *Utah Water Quality Assessment Report to Congress 2002*. Utah Department of Environmental Quality, Salt Lake City, Utah.

APPENDIX A

Consultation, Coordination Correspondence

WATER QUALITY CONSULTATION



December 8, 2003

Mr. Chuck Williamson
Utah Division of Water Rights
P O Box 146300
Salt Lake City, Utah 84114-6300

Subject: Roadway Improvements, SR-24 in Capitol Reef National Park

Dear Chuck:

As I mentioned at our 11400 South site visit in October, URS is working with the Utah Department of Transportation and the National Park Service in preparation of an Environmental Assessment regarding proposed improvements to State Route 24 within Capitol Reef National Park. The EA will present an assessment of potential environmental impacts associated with specific improvements designed to protect the road from incursion by the Fremont River. Problems with undercutting of the road have occurred frequently in the past, and the storm event of August 23, 2003 worsened the problem.

The suggested areas for improvements are shown on the attached map. Following is a general description of each of the erosion control sites along SR-24 and the Fremont River. The site numbers correspond to the numbers on the map.

At each site, stream bank protection measures and possible streamflow diversion techniques would be needed. Design of the erosion control features is still at a preliminary stage. The exact methods and material to be used will be determined during the study.

All of the actual construction would be contained within the polygon identified on the map for each site. Staging and stockpiling are planned for as indicated in the site-specific write-ups. No work is anticipated on the opposite side of the stream from the needed erosion control features.

Site 1 – At this site, the road is immediately adjacent to the riverbank. Construction staging and material stockpiles could be located on the south side of the road immediately west of the eroded area.

URS Corporation
756 East Winchester Street
Suite 400
Salt Lake City, Utah 84107
Tel: 801.904.4000
Fax: 801.904.4100
www.urscorp.com

Site 2 – This site is approximately 35 feet from the north shoulder stripe of the road. It is anticipated that construction equipment will utilize the area between the roadway and the river for construction and that the area directly to the south will be used as a stockpile and staging area.

Site 3 – This site is approximately 30 feet from the north shoulder stripe of the road. It is anticipated that construction equipment will utilize the area between the roadway and the river for construction and that the area directly to the west (and part of the existing pullout) will be used as a stockpile and staging area.

Site 4 – At this site, the road is immediately adjacent to the riverbank. Construction staging and material stockpiles could be located on the north side of the road immediately west or east of the eroded area.

Site 5 – The site is approximately 26 feet from the north shoulder stripe of the road. It is anticipated that construction equipment will utilize the area between the roadway and the river for construction and that the area directly to the west will be used as a stockpile and staging area.

Site 6 – At this site, the road is immediately adjacent to the riverbank. Construction staging and material stockpiles could be located on the north side of the road immediately west or east of the eroded area.

Site 7 – At this site, the road is immediately adjacent to the riverbank. Construction staging and material stockpiles could be located on the east side of the road immediately north or south of the eroded area.

Site 8 – At this site, the road is immediately adjacent to the riverbank. Construction staging and material stockpiles could be located on the north side of the road immediately west or east of the eroded area.

Site 8A – At this site, the road is immediately adjacent to the riverbank. Construction staging and material stockpiles could be located on the north side of the road immediately west or east of the eroded area.

Site 9 – The site is approximately 42 feet from the north shoulder stripe of the road. It is anticipated that construction equipment will utilize the area between the roadway and the river for construction and that the area directly to the west will be used as a stockpile and staging area.

Site 10 – This site is approximately 40 feet from the edge north shoulder strip of the road. It is anticipated that construction equipment will utilize the area between the roadway and the river for construction and that the area directly to the west will be used as a stockpile and staging area.

Site 11 – The site lies approximately 100 feet from the north shoulder strip of the road. It is anticipated that construction equipment will utilize the area between the roadway and the river for construction and that the area directly to the south (between the road and the riverbank) will be used as a stockpile and staging area.

On behalf of the UDOT and the National Park Service, we wish to provide this opportunity for your early comment on potential concerns that your agency might have, as well as recommended mitigative solutions. We are assuming that a Stream Alteration Permit will be required. When the erosion control measures have been identified in detail, a permit application will be submitted.

Please call if you have questions.

Sincerely,

URS

Pat Rothacher
NEPA Specialist

Attachment

c: Dave Worthington, Capitol Reef National Park
Daryl Friant, UDOT
File



State of Utah
DEPARTMENT OF NATURAL RESOURCES
DIVISION OF WATER RIGHTS

Michael O. Leavitt
Governor

Robert L. Morgan
Executive Director

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DOC # 14

PROJ # 24884432

FILE #

December 9, 2003

Pat Rothacher
URS Corporation
756 East Winchester Street, Suite 400
Salt Lake City, UT 84107

Re: Roadway Improvements to SR-24 in Capitol Reef National Park.

Dear Pat:

Thank you for the opportunity to review proposed road improvements to SR-24 and offer our comments prior to developing a final plan. In general, we find that early input on proposed projects tend to save costly and time consuming changes or modifications to projects at a later date. We offer the following comments for your consideration in development of the Environmental Assessment and subsequent submission of a Stream Channel Alteration Application.

It has been our experience that the Fremont River is highly susceptible to rapid lateral migration as you are likely aware. This makes many bank stabilization projects difficult, but not impossible. Invariably, the State Engineer's Office prefers bank stabilization methods that limit the impacts to the natural stream environment and aquatic wildlife. Therefore, you should explore the possibility of bank re-contouring and re-vegetation where possible as well as the installation of rock vanes for reducing near bank stress where erosion threatens SR-24. Appropriate vane design can be found at <http://www.wildlandhydrology.com/assets/cross-vane.pdf>.

The use of rock riprap to line the banks of the river is not encouraged, but will be considered when other, more natural stabilization techniques may not be effective. The use of concrete, such as jersey barricades, for bank stabilization is generally not permitted.

Regardless of which stabilization technique is used, it is important that the form of the channel does not change appreciably as a result of construction. The channel profile, bank and bed roughness, cross-sectional area, and sinuosity should be consistent with adjacent reference reaches.

As for construction, staging, and stockpiling aspects of the project, we offer the following best management practices (BMPs) that should be considered where relevant in your work plan. More than likely, these BMPs will become conditions of a stream alteration permit.

1. Instream work should be accomplished during a period of low flow. Sediment introduced into stream flows during construction must be controlled to prevent increases in turbidity downstream. Flows must be diverted away from the construction area using a non-erodible coffer dam or other equivalent method.
2. Impacts to the stream channel and surrounding environment must be minimized. Vegetation should not be destroyed, but if some disturbance is necessary, then re-vegetating with native species will be required, especially of woody shrubs.
3. Excavated material and construction debris may not be wasted in any stream channel or placed in flowing waters, this will include material such as grease, oil, joint coating, or any other possible pollutant. Excess materials must be wasted at an upland site well away from any channel. Construction materials, bedding material, excavated materials, etc. may not be stockpiled in riparian or channel areas.
3. Equipment should be cleaned to remove noxious weeds/seeds and petroleum products prior to moving on site.
4. Fueling machinery should occur off site or in a confined, designated area to prevent spillage into waterways and wetlands.
5. Fill materials should be free of fines, waste, pollutants, and noxious weeds.
6. Equipment should work from the top of the bank or from the channel to minimize disturbance to the riparian area and to protect the banks. Heavy equipment should avoid crossing and/or disturbing wetlands.
- 7.. Ingress and egress access should be kept to a minimum.
8. Excavated soils should be sorted into mineral soils and top soils. When backfilling a disturbed site top soils should be placed on top to provide a seed bed for native plants.
9. Disturbed areas should be monitored for noxious and undesirable plant species and control actions should be implemented if necessary.
10. Disturbed areas (work site(s), ingress, egress, stockpile site(s), pit) should be revegetated when appropriate after construction with native plants or certified weed-free native seed. The planting should be monitored for success. If the planting fails it should be reseeded/planted.

We hope these comments are of some use to you in developing a plan for the SR-24 roadway improvements project. We may also have additional input as the progress continues. Should you have any questions or require further information, please feel free to contact me at (801) 538-7404.

Sincerely,



Chuck Williamson, P.G.
Stream Alteration Specialist

**THREATENED/ENDANGERED
SPECIES
CONSULTATION**

March 1, 2004

Memorandum

To: Henry Maddux, Field Supervisor, Ecological Services, Utah, USFWS

From: Albert J. Hendricks, Superintendent, Capitol Reef National Park, NPS

Subject: Informal Section 7 Consultation for a proposal to improve portions of State Route 24 in Capitol Reef National Park, Wayne County, Utah

Capitol Reef National Park requests an informal consultation under section 7 of the U.S. Endangered Species Act (Act) with regard to a proposal to modify portions of State Route 24 in Capitol Reef National Park, Wayne County, Utah. The project area is located within the 7.5 minute Fruita quadrangle in Sections 14, 16, 18 and 20, Township 29 South, Range 7 East; and Sections 13, 14, and 24, Township 29 South, Range 6 East, SLB & M.

The proposed action is to construct erosion control features at specific areas of the Fremont River to protect the road from incursion by the river. Problems with undercutting of the road have occurred frequently in the past, and a storm and subsequent flooding on August 23, 2003 worsened the problem.

The suggested areas for improvements are shown on the attached map. Design of the erosion control features is still at a preliminary stage, but would include rip-rap, gabions, or similar anti-erosion devices. Additional space for stockpiling material and staging equipment may be required at a few of the sites; these would be located in previously disturbed areas, and would be examined prior to the initiation of work to assure that no listed or proposed species are present.

Our data indicate that the following species occur in the Park and could potentially occur in the project area:

Plants

Barneby reed-mustard	(<i>Schoenocrombe barnebyi</i>)	Endangered
Jones cycladenia	(<i>Cycladenia humilis</i> var. <i>jonesii</i>)	Threatened
Last Chance townsendia	(<i>Townsendia aprica</i>)	Threatened
Maguire's daisy	(<i>Erigerion maguirei</i>)	Threatened
Western nodding ladies-tresses	(<i>Spiranthes diluvialis</i>)	Threatened
Winkler cactus	(<i>Pediocactus winkleri</i>)	Threatened
San Raphael cactus	(<i>Pediocactus despainii</i>)	Endangered
Wright fishhook cactus	(<i>Sclerocactus wrightiae</i>)	Endangered
Gilia	(<i>Gilia caespitosa</i>)	Candidate

Animals

Mexican spotted owl	(<i>Strix occidentalis lucida</i>)	Threatened
Yellow-billed cuckoo	(<i>Coccyzus americanus</i>)	Candidate

Southwestern willow flycatcher
Bald eagle

(*Empidonax traillii extimus*)
(*Haliaeetus leucocephalus*)

Endangered
Threatened

The Park Service has no records of threatened, endangered or candidate species within the project area and field examinations of the site by Park staff confirm that none of the species listed above are found within the project area. *Spiranthes diluvialis* has historically been known to occur in the "oxbow" area of the river (west of Site 10 on the attached map); however, no individuals or communities have been identified by Park staff in this or any other location in the project area.

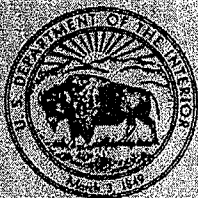
Mexican spotted owls have not been documented in the project area; however, the project lies within designated critical habitat for the species. Construction activities are not expected to affect any potential roosting or nesting areas. We do not believe that the proposed construction or operation of the facility is likely to have an adverse affect on any of the primary constituent elements of the critical habitat and hence further believe that the action would not adversely modify critical habitat.

The Park believes that the project, as proposed, is not likely to adversely affect any protected species, nor is it likely to adversely modify critical habitat of the Mexican spotted owl. The Park seeks the concurrence of the U.S. Fish and Wildlife Service that the proposed action is not likely to impact federally listed species, proposed species, candidate species, or designated or proposed critical habitat. With your concurrence, the Park believes that our obligations under the requirements of Section 7 of the Act will be satisfied.

We appreciate your assistance in an examination of the proposed project. If you have any questions, please contact Dave Worthington, Park Biologist, at 435.425.3791 x145.

Albert J. Hendricks

Enclosure

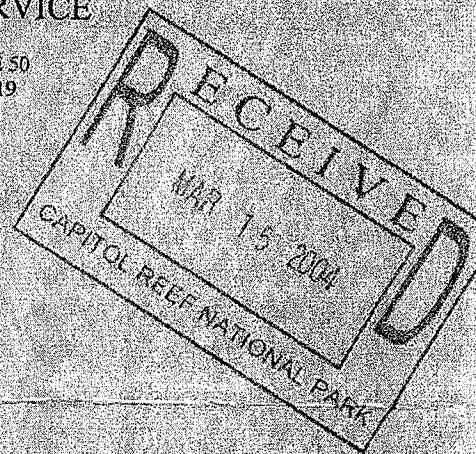


United States Department of the Interior
FISH AND WILDLIFE SERVICE

UTAH FIELD OFFICE
2369 WEST ORTON CIRCLE, SUITE 50
WEST VALLEY CITY, UTAH 84119

In Reply Refer To
FWS/R6
ES/UT
04-0614

March 8, 2004



Memorandum

To: Albert J. Hendricks, Superintendent, Capitol Reef National Park, NPS

From: Utah Field Supervisor, Ecological Services, U.S. Fish and Wildlife Service, Salt Lake City, Utah

Subject: Informal Section 7 Consultation for a proposal to improve portions of State Route 24 in Capitol Reef National Park, Wayne County, Utah

Based on information provided in your letter of March 1, 2004, we concur with your "not likely to adversely affect" determination for threatened and endangered species and critical habitat. Should project plans change, or if additional information on the distribution of listed or proposed species becomes available, this determination may be reconsidered.

Thank you for your interest in conserving endangered species. If we can be of further assistance, please contact Bekee Megown at 801-975-3330, ext. 146.

J.R. Muddox

RECEIVED
CAPITOL REEF NATIONAL PARK

	INT.	DATE
SUPT	AK	3/15
Admin Off		
Bus. Mgmt.		
CH/VP		
CH/Intep		
Exec. Dir.		
EA/UC		
PR/T		
7 Chgo		
FRS		

December 10, 2003

Mr. Bruce Bonebrake
Utah Division of Wildlife Resources
Southern Region
P.O. Box 606
Cedar City, UT 84721-0606

Subject: Roadway Improvements to SR-24 in Capitol Reef National Park

Dear Mr. Bonebrake:

URS is working with the Utah Department of Transportation and the National Park Service in preparation of an Environmental Assessment regarding proposed improvements to State Route 24 within Capitol Reef National Park. The EA will present an assessment of potential environmental impacts associated with specific improvements designed to protect the road from incursion by the Fremont River. Problems with undercutting of the road have occurred frequently in the past, and the storm event of August 23, 2003 worsened the problem.

The suggested areas for improvements are shown on the attached map. Other areas within the project area may need to be constructed in the future, depending on flood activity. The EA will cover the entire project area, from the east end of the Fruita Historic District to milepost 89, just east of Site 11. Following is a general description of each of the erosion control sites along SR-24 and the Fremont River. The site numbers correspond to the numbers on the map.

At each site, stream bank protection measures and possible stream flow diversion techniques would be needed. Design of the erosion control features is still at a preliminary stage. The exact methods and material to be used will be determined during the study.

All of the actual construction for the sites presently identified would be contained within the polygon identified on the map for each site. Staging and stockpiling are planned for as indicated in the site-specific write-ups. No work is anticipated on the opposite side of the stream from the needed erosion control features.

Site 1 – At this site, the road is immediately adjacent to the riverbank. Construction staging and material stockpiles could be located on the south side of the road immediately west of the eroded area.

Site 2 – This site is approximately 35 feet from the north shoulder stripe of the road. It is anticipated that construction equipment will utilize the area between the roadway and the river for construction and that the area directly to the south will be used as a stockpile and staging area.

Site 3 – This site is approximately 30 feet from the north shoulder stripe of the road. It is anticipated that construction equipment will utilize the area between the roadway and the river for construction and that the area directly to the west (and part of the existing pullout) will be used as a stockpile and staging area.

Site 4 – At this site, the road is immediately adjacent to the riverbank. Construction staging and material stockpiles could be located on the north side of the road immediately west or east of the eroded area.

Site 5 – The site is approximately 26 feet from the north shoulder stripe of the road. It is anticipated that construction equipment will utilize the area between the roadway and the river for construction and that the area directly to the west will be used as a stockpile and staging area.

Site 6 – At this site, the road is immediately adjacent to the riverbank. Construction staging and material stockpiles could be located on the north side of the road immediately west or east of the eroded area.

Site 7 – At this site, the road is immediately adjacent to the riverbank. Construction staging and material stockpiles could be located on the east side of the road immediately north or south of the eroded area.

Site 8 – At this site, the road is immediately adjacent to the riverbank. Construction staging and material stockpiles could be located on the north side of the road immediately west or east of the eroded area.

Site 8A – At this site, the road is immediately adjacent to the riverbank. Construction staging and material stockpiles could be located on the north side of the road immediately west or east of the eroded area.

Site 9 – The site is approximately 42 feet from the north shoulder stripe of the road. It is anticipated that construction equipment will utilize the area between the roadway and the river for construction and that the area directly to the west will be used as a stockpile and staging area.

Site 10 – This site is approximately 40 feet from the edge north shoulder strip of the road. It is anticipated that construction equipment will utilize the area between the roadway and the river for construction and that the area directly to the west will be used as a stockpile and staging area.

Site 11 – The site lies approximately 100 feet from the north shoulder strip of the road. It is anticipated that construction equipment will utilize the area between the roadway and the river for construction and that the area directly to the south (between the road and the riverbank) will be used as a stockpile and staging area.

On behalf of the UDOT and the National Park Service, we wish to provide this opportunity for your early comment on potential concerns that your agency might have, as well as recommended mitigative solutions.

Please call if you have questions.

Sincerely,

URS

Pat Rothacher
NEPA Specialist

Attachment

c: Dave Worthington, Capitol Reef National Park
Daryl Friant, UDOT
File



Record of Conversation

Date: 1/09/04

Recorded by: Pat Rothacher

Talked with: (Left message with) Bruce Bonebrake

Of: Div. Wildlife Resources
(Cedar City)

Phone Number: 435-865-6100

Subject: Comments regarding URS Letter Dated 12/10/03 – SR-24 Project

I left a voicemail message asking if Bruce had received our letter regarding this project, and if his agency had any comments or concerns at this time.

On 1/13/04, I received a voicemail message from Donald Eller, saying that Bruce Bonebrake had asked him to respond to my message. He stated that his agency did want to be involved, that they appreciated receiving the letter, but had no specific comments at this time. He left his phone number, which is 435-865-6112.

**CULTURAL/ARCHEOLOGICAL/
PALEONTOLOGICAL/
NATIVE AMERICAN
CONSULTATION**



United States Department of the Interior

NATIONAL PARK SERVICE

Capitol Reef National Park
Torrey, Utah 84775

IN REPLY REFER TO:
H2215 (CARE-CR)

February 20, 2004

Jim Dykmann
Utah State Historical Society
300 Rio Grande
Salt Lake City, UT 84101

Reference: Erosion Control Work at Fremont River Locations along SR-24

Dear Mr. Dykmann:

In accordance with §106 of the National Historic Preservation Act of 1966, as amended, and 36 CFR Part 800, we wish to initiate consultation with the State Historic Preservation Officer and seek your review and comment regarding a proposed undertaking by the Utah Department of Transportation (UDOT) along state highway 24 within Capitol Reef National Park. The Utah Department of Transportation proposes to conduct erosion control activities along the highway 24 between Fruita and the eastern park boundary.

PROJECT DESCRIPTION AND DETERMINATION OF AREA OF POTENTIAL EFFECT

Flood events along the Fremont River periodically close state highway 24 and/or deposit large quantities of material on the road which must be removed to allow traffic to continue. The river and the highway at this point pass through a narrow canyon within the Waterpocket Fold that limits where the water can go. Placement of riprap along the road or streambed and stream barbs placed within the river itself are planned in order to direct river flows and limit erosion along the road (Map 1). Specifically UDOT's plans include:

Site 1 – At this site, the road is immediately adjacent to the riverbank. This site will require the placement of riprap on the south side of the road to protect it from further erosion. Stream barbs consisting of rows of riprap will likely be placed in the streambed to encourage the stream to flow farther away from the road. No work is anticipated on the opposite side of the stream. Construction staging and material stockpiles could be located on the south side of the road immediately west of the eroded area.

Site 2 – This site is not immediately adjacent to the roadway. There is approximately 35 feet of distance from the edge of road east to the riverbank. This site will require the placement of either riprap or other material to stabilize the riverbank and in the river to direct river flows. The exact material that will be used will be determined during the study. No work is anticipated on the opposite side of the stream. It is anticipated that construction equipment will utilize the area between the roadway and the river for

construction and that the area directly to the south will be used as a stockpile and staging area.

Site 3 – This site is not immediately adjacent to the roadway. There is approximately 30 feet of distance from the edge of road north to the riverbank. This site will require the placement of either riprap or other material to stabilize the riverbank and in the river to direct river flows. The exact material that will be used will be determined during the study. No work is anticipated on the opposite side of the stream. It is anticipated that construction equipment will utilize the area between the roadway and the river for construction and that the area directly to the west (and part of the existing pullout) will be used as a stockpile and staging area.

Site 4 – At this site, the road is immediately adjacent to the riverbank. This site will require the placement of riprap on the north side of the road to protect it from further erosion. Stream barbs consisting of rows of riprap will likely be placed in the streambed to encourage the stream to flow farther away from the road. No work is anticipated on the opposite side of the stream. Construction staging and material stockpiles could be located on the north side of the road immediately west or east of the eroded area.

Site 5 – This site is not immediately adjacent to the roadway. There is approximately 26 feet of distance from the edge of road north to the riverbank. This site will require the placement of either riprap or other material to stabilize the riverbank and in the river to direct river flows. The exact material that will be used will be determined during the study. No work is anticipated on the opposite side of the stream. It is anticipated that construction equipment will utilize the area between the roadway and the river for construction and that the area directly to the west will be used as a stockpile and staging area.

Site 6 – At this site, the road is immediately adjacent to the riverbank. This site will require the placement of riprap on the north side of the road to protect it from further erosion. Stream barbs consisting of rows of riprap will likely be placed in the streambed to encourage the stream to flow farther away from the road. No work is anticipated on the opposite side of the stream. Construction staging and material stockpiles could be located on the north side of the road immediately west or east of the eroded area.

Site 7 – At this site, the road is immediately adjacent to the riverbank. This site will likely require the placement of riprap on the east side of the road to protect it from further erosion. Stream barbs consisting of rows of riprap will likely be placed in the streambed to encourage the stream to flow farther away from the road. No work is anticipated on the opposite side of the stream. Construction staging and material stockpiles could be located on the east side of the road immediately north or south of the eroded area.

Site 8 – At this site, the road is immediately adjacent to the riverbank. This site will require the placement of riprap on the north side of the road to protect it from further erosion. Stream barbs consisting of rows of riprap will likely be placed in the streambed to encourage the stream to flow farther away from the road. No work is anticipated on the opposite side of the stream. Construction staging and material stockpiles could be located on the north side of the road immediately west or east of the eroded area.

Site 8A – At this site, the road is immediately adjacent to the riverbank. This site will require the placement of riprap on the north side of the road to protect it from further

erosion. Stream barbs consisting of rows of riprap will likely be placed in the streambed to encourage the stream to flow farther away from the road. No work is anticipated on the opposite side of the stream. Construction staging and material stockpiles could be located on the north side of the road immediately west or east of the eroded area.

Site 9 – This site is not immediately adjacent to the roadway. There is approximately 42 feet of distance from the edge of road north to the riverbank. This site will require the placement of either riprap or other material to stabilize the riverbank and in the river to direct river flows. The exact material that will be used will be determined during the study. No work is anticipated on the opposite side of the stream. It is anticipated that construction equipment will utilize the area between the roadway and the river for construction and that the area directly to the west will be used as a stockpile and staging area.

Site 10 – This site is not immediately adjacent to the roadway. There is approximately 40 feet of distance from the edge of road north to the riverbank. This site will require the placement of either riprap or other material to stabilize the riverbank and in the river to direct river flows. The exact material that will be used will be determined during the study. No work is anticipated on the opposite side of the stream. It is anticipated that construction equipment will utilize the area between the roadway and the river for construction and that the area directly to the west will be used as a stockpile and staging area.

Site 11 – This site is not immediately adjacent to the roadway. There is approximately 100 feet of distance from the edge of road north to the riverbank. This site will require the placement of either riprap or other material to stabilize the riverbank and in the river to direct river flows. The exact material that will be used will be determined during the study. No work is anticipated on the opposite side of the stream. It is anticipated that construction equipment will utilize the area between the roadway and the river for construction and that the area directly to the south (between the road and the riverbank) will be used as a stockpile and staging area.

Capitol Reef National Park has determined that the Area of Potential Effect (APE) includes the canyon corridor from Fruita to the eastern park boundary. The highway and Fremont River are constrained within the steep canyon walls. Construction will not occur within the Fruita Historic District however. We seek your concurrence with this determination, in accordance with 36 CFR §800.4.

DETERMINATION OF ELIGIBILITY

A review of park site files and archeological reports reveals that intensive archeological surveys were conducted within the APE between 1990 and 1992 by Archeological-Environmental Research Corporation (AERC). Conducted in association with the National Park Service and Garkane Power Association, AERC, under the direction of Richard Hauck, identified and evaluated 55 historic properties. Not all of these properties have the potential to be affected by the proposed undertaking. Table 1 identifies those properties that are located in the vicinity of the proposed erosion control activities. No final report was produced for the earlier survey, however a draft report entitled *Archeological Evaluations in Capitol Reef National Park* was provided to the State Historic Preservation Office. The later survey produced a report entitled *Cultural Resource Evaluation of a Proposed Transmission Corridor in Capitol Reef National Park, Wayne County, UT*, which the park

assumes is also in the possession of the SHPO's office. NPS site files also reveal that Determinations of Eligibility were completed for the relevant sites. Copies of these determinations are on file at the SHPO's office.

DETERMINATION OF EFFECT

A total of 26 prehistoric sites have been identified within the vicinity of erosion control activities, and have the potential to be affected by these activities. No sites will be affected by proposed construction activities. However, rivers being what they are, there is the potential that placement of riprap along stream banks and stream barbs placed within the river may eventually alter the channel of the river so that these sites may be adversely affected. The river could also change its course on its own, subsequently impacting these same sites. Hydrologic expertise cannot predict what course the river will take as a result of proposed erosion control measures. Consequently the park will conduct periodic monitoring of these sites in order to identify and evaluate possible future impacts.

We are consulting with you regarding 36 CFR §800.4 and §800.5. It is our opinion based upon past archeological work and information in our files that the eligible sites in the vicinity of the proposed undertaking will not be adversely affected. We seek your concurrence with this determination. For your convenience we have provided *I Concur* and *Date* blocks below.

If you have any questions please contact Cultural Resources Program Manager Anne Worthington at (435) 425-3791 ext. 146.

Thank you for your assistance with this project.

Sincerely,

Albert J. Hendricks
Superintendent

Enclosures

I Concur: _____ Date: _____



Michael O. Leavitt
Governor

State of Utah
Department of Transportation

DOC # 11
PROJ # 245844132
FILE # _____

John R. Njord, P.E.
Executive Director

November 3, 2003

Ms. Martha Hayden, Paleontological Assistant
Utah Geological Survey
P.O. Box 146100
Salt Lake City, Utah 84114-6100

RE: SP-0024(35)85; Fremont River Scour Mitigation
U.C.A. 63-73-19 compliance

Dear Ms. Hayden:

UDOT in cooperation with Capitol Reef National Park is proposing to fix several locations along the Fremont River to keep it from washing out State Route 24. The project extends from the Fruita Historic District at about highway Reference Post 81.35 extending to RP 89 on the east side of the park. Please find enclosed three maps showing the project location. The pink polygons are preliminary high priority locations for scour mitigation. In accordance with UDOT's executed Memorandum of Understanding with your office, please complete a literature search and let me know if there are any known fossil localities, if there are fossiliferous formations in the project area, or if a paleontological survey is required. The accounting information for your literature search is: 280 810 4210 XFD 725D 7029001D.

The legal location of the project is as follows: Sec. 14 and 13, T. 29S R. 6E and Sec. 18, 17, 16, 15 and 14 T. 29S R. 7E of the Fruita, Utah USGS 7.5' (1987) quad; Sec 13, T. 29S R. 7E of the Caineville, Utah USGS 7.5' (1987) quad.

Thank you for your efforts. Should you require additional information or assistance, please contact me at (435) 893-4753 or susanmiller@utah.gov.

Respectfully,

Susan G. Miller, NEPA/NHPA Specialist
Region Four Environmental

Sgm/enclosures

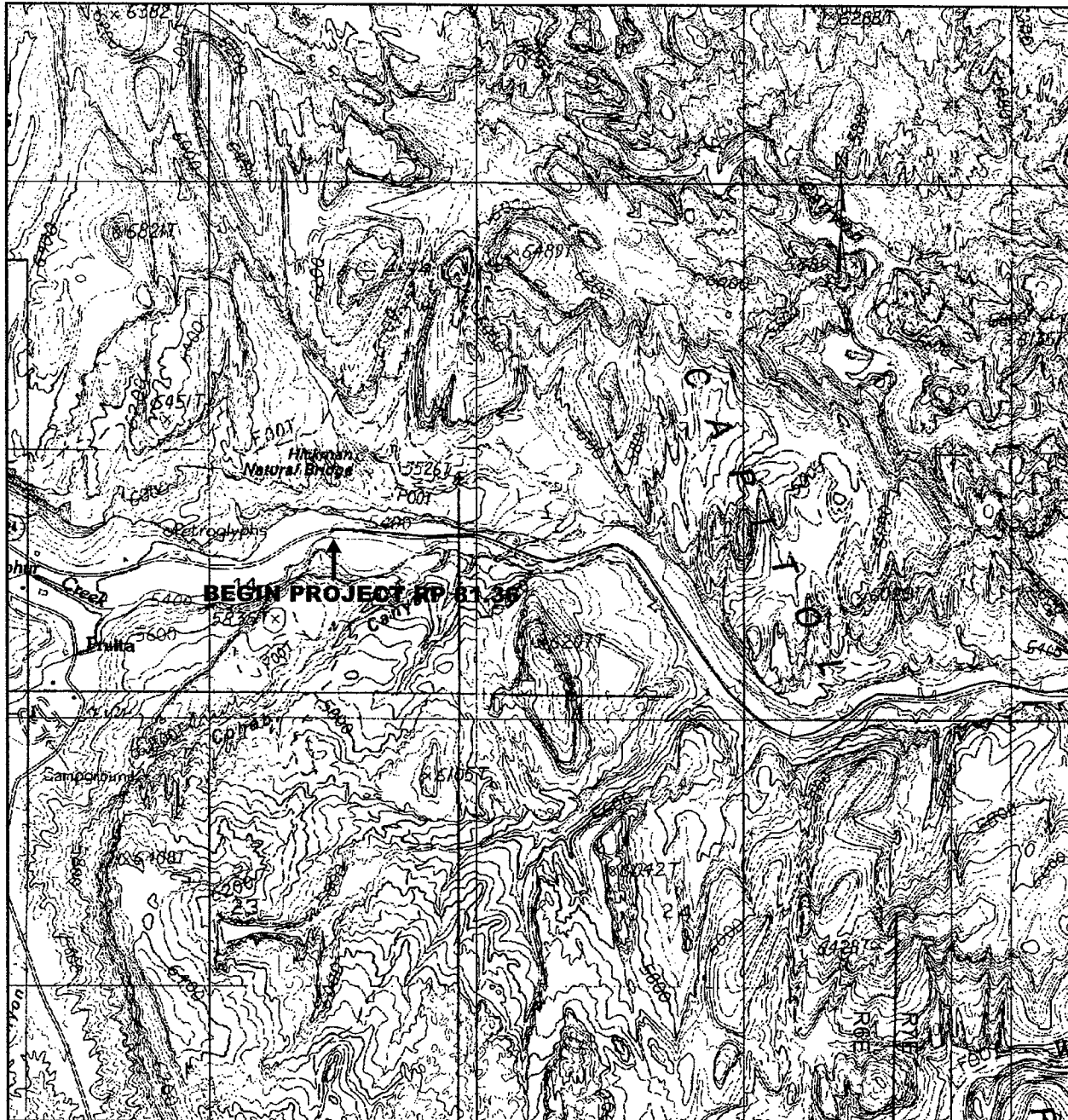
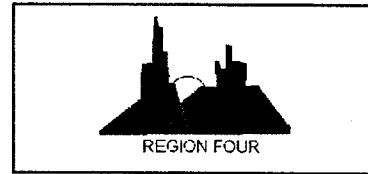
Cc: (w/enclosures)

Daryl Friant, Environmental Engineer
Anne Worthington, Capitol Reef NP
Alex Hildebrandt, URS

Utah!
Where ideas connect™

Region Four

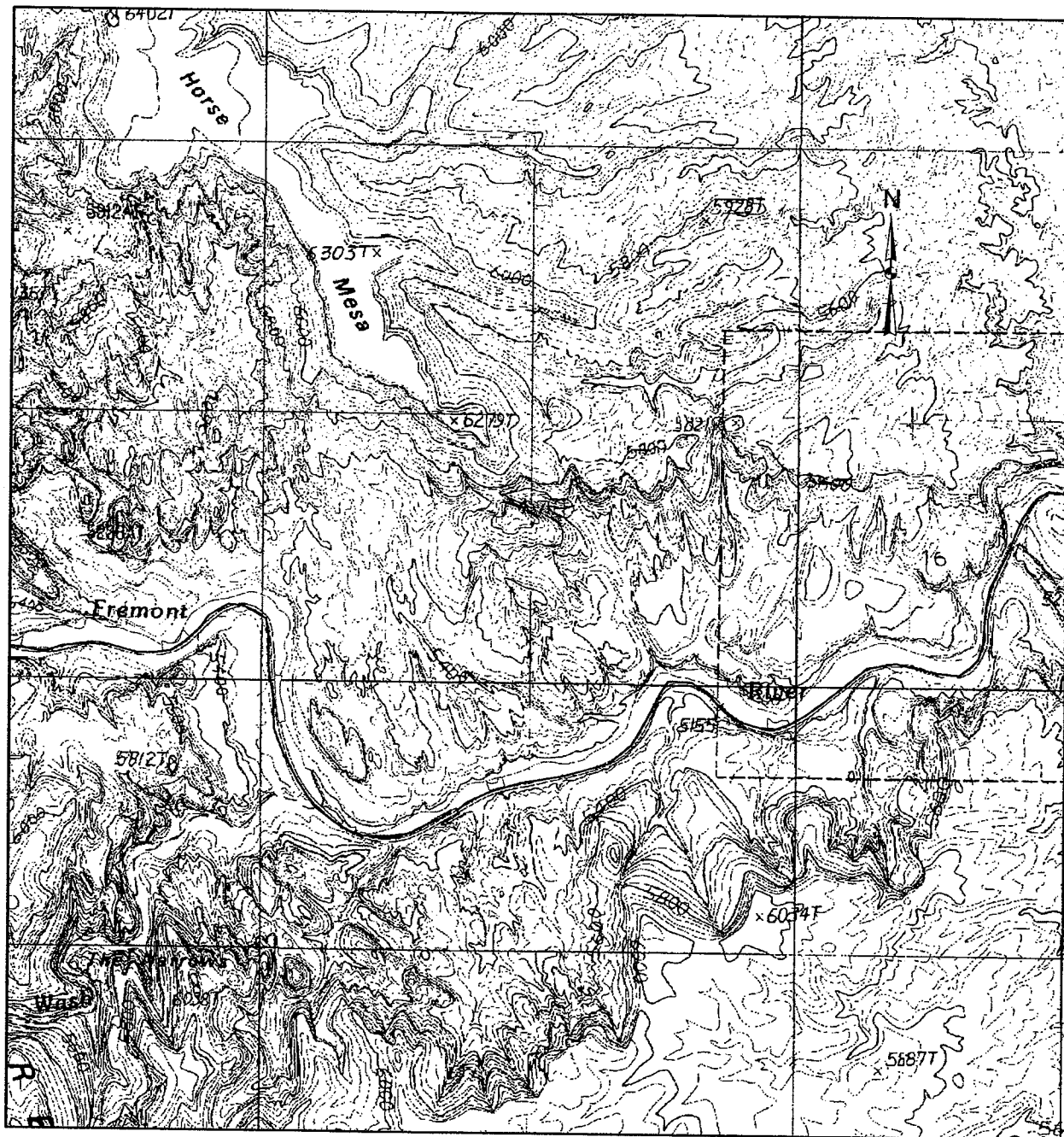
1345 South 350 West • Richfield, Utah 84701 • Telephone (435) 893-4799 • Fax (435) 896-6458 • www.utah.gov



SP-0024(35)85; FREMONT RIVER
PROJECT LOCATION
FRUITA, UTAH 7.5' USGS (1987)
T. 29S R. 6/7E
1:24000



REGION FOUR



SP-0024(35)85; FREMONT RIVER
PROJECT LOCATION
FRUITA, UTAH 7.5' USGS (1987)
T. 29S R. 7E
1:24000



United States Department of the Interior

NATIONAL PARK SERVICE
Capitol Reef National Park
Torrey, Utah 84775

IN REPLY REFER TO:
H4217 (CARE-CR)

November 20, 2003

Governor
Pueblo of Jemez
Box 100
Jemez Pueblo, NM 87024

Dear Sir or Madam:

An Environmental Assessment (EA) regarding proposed improvements to State Route 24 within Capitol Reef National Park is being prepared. The EA will present a detailed evaluation of specific improvements designed to protect the road from incursion by the Fremont River. Problems with undercutting of the road have occurred frequently in the past, and the storm event of August 23, 2003 worsened the problem.

The suggested areas for improvements are shown on the attached map.

Improvements may consist of riprap placed in the river channel, the construction of diversionary structures such as spurs, or other methods of protecting the road from erosion.

The EA will include a review of existing cultural resource studies in the area to determine if any cultural resource sites will be affected. Cultural resource studies will be undertaken if it is determined that the area has not been previously surveyed.

In accordance with Section 106 regulations published by the Advisory Council on Historic Preservation (ACHP), 36 CFR Part 800, Capitol Reef National Park and its partner on the project, the Utah Department of Transportation request that you review the above information and the enclosed map to determine if there are any important traditional religious and/or cultural properties that may be affected by the proposed undertaking. If you believe that there are any historic properties that may be impacted, we request that you notify us of these properties.

We hope that this early review opportunity will give you ample time to identify any concerns you may have about the proposed project. Once the EA is developed and

finalized, you will be afforded another opportunity to comment as part of the public review process.

Please forward any written comments to me at the address on this letterhead within 30 days. Whether or not you are able to respond at this early opportunity, you will have a later chance to participate during the 30-day EA review period. If you have any questions please contact Anne Worthington, Cultural Resource Manager, at (435) 425-3791, ext. 146.

Capitol Reef National Park recognizes, because of your past consultations with us, that this park is part of your cultural heritage. We hope to ensure that your ongoing interests in park management issues are heard and considered.

Sincerely,

A handwritten signature in dark ink, appearing to read "Albert I. Hendricks", written over a horizontal line.

Albert I. Hendricks
Superintendent

Enclosure

**PUBLIC SCOPING
NOTICE**

Utah Department of Transportation and Capitol Reef National Park Propose a Study of Erosion Control Measures along the Fremont River and Utah State Route -24 within Capitol Reef National Park.

The Utah Department of Transportation (UDOT), in conjunction with Capitol Reef National Park, are proposing to prepare an environmental assessment in compliance with the National Environmental Policy Act of 1969. The assessment will study erosion control measures to be placed between the Fremont River and Utah State Route 24 (SR-24) within the boundaries of Capitol Reef National Park, east of the Fruita Historic District. The action is needed due to recent floods along the Fremont River that have eroded the streambank immediately adjacent to SR-24 in several locations, jeopardizing the integrity of the highway. Repair work and bank stabilization in these areas would maintain the safety of SR-24 and promote native habitats along the river. Preparation of the environmental document will identify locations for stabilization measures and what those measures will be. The environmental assessment will be made available for public review and comment once completed. Any comments should be directed to:

Superintendent
Capitol Reef National Park
HC 70 Box 15
Torrey, UT 84775

APPENDIX B

Technical Descriptions of Erosion Control/Bank Stabilization Measures

SR-24 Capitol Reef EA

Recommended Channel Stabilization and Bank Erosion Control Alternatives

The following list of recommended channel stabilization and bank erosion control alternatives has been selected based on a broad range of project related criteria and from information obtained about the current conditions of the Fremont River through Utah's Capitol Reef National Park.

The criteria used for selecting the recommended channel stabilization and bank erosion control alternatives included the following:

- Minimization of construction impacts associated with the placement of the alternative.
- Ease of constructibility and maintenance associated with the alternative.
- Aesthetic nature associated with the alternative.
- Riparian and aquatic habitat characteristics associated with the alternative.
- Functionality and ability to withstand erosion during large flooding events.
- The use of rock and vegetation as construction materials. Sheet piling, recycled concrete, soil cement, gabions, cribbing, jacks, paving, filled mattresses, articulated block systems, or refuse material were considered undesirable channel armoring alternatives for the proposed project.

It is natural for stable rivers to meander and for riverbank locations to change in location and configuration over time. A natural channel is in a constant state of flux, trying to adjust to the impacts caused by high and low flow events. The use of lateral and/or vertical stabilization to prevent channel meandering within isolated river reaches can often adversely impact up and downstream reaches that appear to be stable. Reaches with bank protection may not experience lateral erosion, however their use can result in increased erosional forces in adjacent reaches or at neighboring unprotected banks. Stabilization of individual riverbanks may cause future problems at channel locations that are currently considered to be unproblematic.

The Utah Department of Transportation (UDOT) should be aware of the possibility that additional channel stabilization may be required in the future as the channel adjusts to the placement of the recommended channel stabilization and bank erosion control alternatives. UDOT should routinely inspect the riverbanks stabilized through the use of the recommended alternatives. No channel stabilization and bank control alternative should be considered permanent. Flood events and morphologic adjustments could destroy or reduce the effectiveness of the selected erosion control alternative.

All of the recommended channel stabilization and bank erosion control alternatives attempt to prevent the lateral migration of the river. Based on the available information, vertical stabilization, or grade control, does not appear to be required or desired within the identified river reach, and has therefore not been investigated or recommended for the project. Should a vertical instability, such as a head cut or hard point, exist within the river reach, the long term stability and effectiveness of the recommended alternatives could be questionable.

Rock riprap has been used for all of the recommended channel stabilization and bank erosion control alternatives. Vegetation has been included as part of the recommended design as a means of camouflaging the stabilization alternatives. Vegetation alone cannot provide UDOT with the desired long-term stability measures required for protecting SR-24. The Fremont River along the section of interest is quite well vegetated. If vegetation alone could prevent channel migration, the existing

channel configuration would not have evolved. The recommended channel stabilization and bank erosion control alternatives for the Fremont River paralleling SR-24 include:

- Bendway Weirs (Stream Barbs)
- Armored Embankment
- Boulder Toe Protection
- Windrow Revetment

The selected alternatives discussed below can be used together or in conjunction. For example in locations where additional creek stabilization is warranted, bendway weirs can be used with an armored embankment, boulder toe protection and bendway weirs can be used together, or windrow revetment can be placed behind a bend where boulder toe protection has been placed. Combinations of the recommended alternatives should be used in locations where the Fremont River is immediately adjacent to SR-24 or where higher erosion is anticipated due to greater velocities or a tighter bend meander radius.

It is difficult to recommend exactly which alternative is best suited for each of the identified areas of concern. Qualified individuals should base the selection of the preferred channel stabilization and bank erosion alternative, or combination of alternatives, on a site inspection. Site design and alternative selection should not be left up to inexperienced field personnel. Additionally, the recommended alternatives are site specific. The use or application of the recommended alternatives (and their associated rock sizes, dimensions, etc.) at other bends or rivers is not advised without investigating the site-specific characteristics or long-term trends associated with the area of interest. As previously mentioned, the alternatives and their associated characteristics were derived for the Fremont River within the reach associated with the SR-24 Capitol Reef EA.

Construction activities associated with the recommended channel stabilization and bank erosion alternatives will require environmental and waterway permitting. Permitting may be required for accessing the river, relocating utilities, impacting cultural resources, and various other local, state, and federal regulations. At a minimum, a U.S. Army Corps of Engineers (COE) Section 404 permit will be required for impacting any jurisdictional wetlands or work impacting greater than approximately 0.1 acres or approximately 200 linear feet of the ordinary high water channel (exact limits are permit specific and should be considered as part of the alternative selection process).

Bendway Weirs (Stream Barbs)

Description

Bendway weirs are rock structures placed within the river that force flows away from the riverbank.

Application Location

Bendway weirs can be used at all bend locations requiring stream stabilization and bank line reclamation.

Advantages

Bendway weirs induce sediment deposition along riverbanks and can improve aquatic habitat. They are considered aesthetic and can easily be constructed if adequate on-site construction management is present during construction. Extremely functional and effective means of stabilizing a channel bend.

Disadvantages

Bendway weirs provide little bank protection during high flow events. The weirs are sized so that high flows pass over them. No revetment is placed on or along the existing riverbank. Construction activities are required within the active channel and below the channel invert. If improperly placed, the bendway weirs can adversely impact the riverine environment. They cannot be haphazardly designed or placed.

Discussion & Requirements

Bendway weirs have been successfully used for stream stabilization and bank line reclamation on small rivers and creeks throughout the West. When properly placed, they redirect outer bank flows towards the center of the channel and reduce near bank velocities. They are typically visible above the ordinary water surface and are designed so that channel flows are diverted around the weir and flows along the bank are passed through or over the structure. Deposition of sediments is normally induced along the bank line and small scour hole is created immediately downstream at the end of the weir. Proper placement not only prevents the erosion of the bank line but also tends to improve the aquatic habitat along the channel bend. Bendway weirs are designed for ordinary flow events and tend to be less functional during high flows or flooding events. Bank erosion may occur during high flows.

Careful attention should be paid to the planform layout of the individual bendway weirs. Improper placement, spacing, and the use of too few, or too many, can have opposite desired effect by causing increase erosional forces along the bank line. Bendway weirs require a high degree of construction management by qualified field persons with hydraulic engineering experience or understanding. A great deal of field fitting is often required.

Access to the riverbank and work within the river is required for construction of this bank protection alternative. Both of these issues need to be considered when selecting the use of this alternative. The U.S. Department of Transportation Federal Highway Administration's (FHWA) *Hydraulic Engineering Circular No. 23* includes a detailed discussion and an example of how the weirs should be placed.

The following particulars should be included or addressed in the final bendway weir configuration:

- Regardless of what the FHWA diagrams show, large rock (greater than 18" in diameter) should be used for the construction of the bendway weirs. Piles of small rocks can be easily eroded or removed by vandalism. Rock used in the weirs should have its greatest dimension not greater than three times its least dimension, and have a specific gravity of no less than 2.5.
- Rock placement needs to be performed cognizant of impacts caused by potential high flows. Rocks comprising the top of the weir need to be stable.
- The weirs need to be embedded into the riverbank by several feet.

Armored Embankment

Description

An armored embankment is a channel bank or bank line that has been re-graded and protected by the placement of riprap.

Application Location

Armored embankments can be used at locations that are experiencing lateral movement and have available space for re-grading efforts.

Advantages

An armored embankment is one of the most durable and effective means of providing horizontal control in an area experiencing channel migration.

Disadvantages

Grading activities necessary for creating an armored embankment can severely impact a large area and require the removal of a great deal of bank material and vegetation. Construction activities are required within the active channel and below the channel invert.

Discussion & Requirements

Embankment armoring consists of placing revetment material along a re-graded riverbank, and is quite similar to providing protection for a spill through bridge abutment. Although the rock size used for channel protection is typically smaller than that used at a bridge, the revetment configuration and functionality is quite similar. Flows along the bank line interact with a layer of riprap rather than the soils comprising the riverbank, and lateral channel migration is inhibited.

The armored embankment alternative can be quite invasive and result in the removal of a large amount of bank material and existing riparian vegetation. However, it is the most effective means of armoring a channel bank. Placing soil on top of the revetment and planting native vegetation can yield over time a stable and natural appearing channel bank (provided a 3:1 rock to soil mixture is used for the revetment).

This channel stabilization and bank erosion control alternative often requires the existing river bank to be laid back at a gentler slope for accommodating the riprap revetment. Extensive grading activities can often be required. Slope grading often results in encroachment into areas that cannot be disturbed (e.g. utility corridors, cultural areas, roadway clear zone, etc.). Locations with these constraints sometimes require that the embankment armoring not extend to the top of the riverbank. Terraces and/or creative grading solutions are often required. Site-specific conditions dictate the specific armored embankment configuration.

The following particulars should be included or addressed in the final armored embankment configuration:

- Riprap used for protecting the embankment should have:
 - A minimum D_{50} of approximately 12 inches.

- Be well graded.
 - Be comprised of angular stones.
 - Be comprised of stones having a greatest dimension not greater than three times its least dimension.
 - Have a specific gravity no less than 2.5.
- Riprap comprising the embankment armoring should be placed at a 3:1 rock to soil ratio. The soil fills the voids within the revetment and provides a media for vegetation growth. Not including the 3:1 ratio might necessitate the placement of a filter layer or geotextile between the riprap and the re-graded embankment.
- If the removal of fine materials from under and behind the embankment armoring is of concern, a geotextile should be placed under the riprap revetment. Placement of the 3:1 ratio may not be adequate for creating a permanent armoring if the bank is comprised of highly erodible material. The geotextile should extend into the active channel under the toe of the embankment armoring. The selected geotextile should be tight enough for preventing the washing of fine materials, and strong enough to withstand the puncture and tear forces associated with rock placement.
- The reshaped embankment shall be graded at a maximum slope of 2 horizontal to 1 vertical. The riprap revetment will not be stable for slopes steeper than this.
- The top of the riprapped embankment should be covered with several inches of topsoil and heavily seeded with a hearty native seed mixture. If the 3:1 rock to soil ratio is not included in the design, the layer of topsoil will wash into the revetment and no vegetative cover will be established. All areas disturbed by the armored embankment construction process should be roughened and seeded as part of the construction completion.
- Willow cuttings should be placed along the toe of the revetment within the riprap matrix. The local conservation service should be contacted as to criteria associated with placement techniques and planting season. Improperly performed or timed willow plantings have a very low chance of survival. The willow stakings need to penetrate the riprap layer and geotextile (if used).
- The toe of the embankment armoring shall extend into and below the river by several feet. For this project, three to five feet should be adequate.
- In situ river bottom materials excavated for the river for construction of the embankment slope and toe should be included in the visible sections of the finished revetment cross section for aiding in camouflaging of the bank stabilization.
- The ends of the embankment armoring should be keyed back away from the channel by several feet. The keying helps prevent the channel from eroding behind the embankment armoring.
- It is recommended that a track-hoe or other heavy construction equipment be driven over the final section of embankment armoring to create a more interlocked riprap layer and to sink it into the newly re-graded slope. Placement of in situ materials and topsoil should be done after this step.
- Transitions may need to be graded between the section protected by the armored embankment and the adjacent unprotected channel bank line. Drastic transitions require larger or more robust keyed in areas to prevent undermining or removal of the embankment armoring.
- Use straw or coconut erosion blanket over the topsoil to hold seed and prevent rill erosion prior to vegetative growth.

Boulder Toe Protection

Description

Lateral channel migration is inhibited through the placement of boulders along the toe of the existing riverbank.

Application Location

Boulder toe protection is ideally suited for locations having larger bend radii and channel bank incision is minor to moderate.

Advantages

Protecting the toe of a river bend is a fast and easy way to reduce the erosive forces acting on the bank line. The existing channel bank can be maintained and allowed to naturally degrade in slope over time.

Disadvantages

Placement of boulders in bends that have deep flows or have steep and abrupt drop offs can be difficult. Boulders need to be placed individually by machinery capable of manipulating the boulders. Small boulders provide little bank protection during high flow events.

Discussion & Requirements

At some locations, the combination of bend configuration and channel bank line geometry may warrant only armoring the toe of the riverbank. At these locations a boulder toe protection may be acceptable for providing channel stabilization. Areas with a wide adjacent floodplain and little elevation differential between the channel bottom and the floodplain can be stabilized by placing boulders along the toe of the existing channel bank.

This alternative is good for areas experiencing bank migration resulting from toe erosion. However, the alternative should be avoided in locations where bank failure is likely to be caused by flows entering the channel from the over bank areas.

The boulders should be individually placed and large enough to resist movement during flood events. Spacing between the boulders should be limited and placement should be somewhat staggered to prevent a smooth lining along the outer edge of the channel bank. Keying the boulders into the river bottom and into the riverbank is recommended. Keyed in boulders have less chance of being transported downstream or dislodged by flood events. Areas between and behind the boulders can be vegetated. If the boulders are large enough and spaced close enough, minor re-grading behind the boulders can be performed, and a more stable and irregular river embankment can be created. Aesthetic placement of the boulders is paramount for achieving a natural looking setting. The boulders cannot be strewn about haphazardly. Improper boulder placement can result in increased erosion activity at a river bend. Proper placement can also be beneficial for aquatic habitat.

The following particulars should be included or addressed in the final boulder toe protection configuration:

- Boulders used for protecting the embankment should have:
 - A minimum D_{50} of approximately 36 inches.
 - Have its greatest dimension not greater than three times its least dimension.
 - Have a specific gravity no less than 2.5.
- Boulders should be keyed into the river bottom and riverbank by at least 12 to 18 inches.
- Willow cuttings should be placed between and behind the boulders. The local conservation service should be contacted as to criteria associated with placement techniques and planting season. Improperly performed or timed willow plantings have a very low chance of survival.
- Boulders should be placed upstream and downstream for a distance to reduce the visual impact associated with the alternative.
- Perform localized grading activities behind large boulders or sets of boulders.

Windrow Revetment

Description

Windrow revetment is a rock filled trench that is allowed to be undermined by the river.

Application Location

Windrow revetment can be used wherever adequate space is available for allowing the river to naturally migrate.

Advantages

This horizontal control alternative does not require reshaping of the riverbank, work within the active channel, or require the removal of riparian habitat. Trenching and rock placement is fairly straightforward.

Disadvantages

If the river undermines the revetment and it is launched, additional aesthetic treatments may be required. The revetment trench will ultimately define the channel bend. If the trench is improperly located, has inadequate rock quantities, or the keyed in sections are not adequate, the alternative will be ineffective at preventing lateral migration.

Discussion & Requirements

Windrow revetment is an erosion control technique consisting of placing a fixed amount of erosion resistant material (riprap) a fixed distance outside of an existing bank line. Basically, the concept entails digging a trench away from the river, filling it with rock, and letting the river migrate over to the trench. The area between the natural or existing bank line and the windrow is allowed to erode through its natural process until the erosion reaches and undercuts the riprap revetment. As the riprap revetment is undercut it falls into the eroding area and prevents further undercutting at the location. The resulting bank line remains somewhat natural and takes on a non-uniform appearance due to intermittent lateral erosion into the windrow location. The U.S. Department of Transportation Federal Highway Administration's (FHWA) *Highways in the River Environment* includes a more detailed account of this bank stabilization alternative.

This channel stabilization and bank erosion control option lends itself to bend locations that are experiencing migration and:

- Existing vegetation is plentiful and/or the removal of the existing bank line habitat and features is undesirable.
- The channel has room to migrate before bank erosion control is absolutely required.
- Can be placed within roadway right-of-way away from a section of river requiring attention.
- A quick and easy erosion control solution is required.

The following particulars should be included or addressed in the final windrow revetment configuration:

- The rock within the windrow should have:
 - A minimum D_{50} of approximately 18 inches.
 - Be well graded.
 - Be comprised of angular stones.
 - Be comprised of stones having a greatest dimension not greater than three times its least dimension.
 - Have a specific gravity no less than 2.5.
- Riprap within the windrow should be placed at a 3:1 rock to soil ratio. The soil fills the voids within the revetment and provides a media for vegetation growth.
- The top of the windrow trench should be covered with several inches of topsoil and heavily seeded with a hearty native seed mixture. If the 3:1 rock to soil ratio is not included in the design, the layer of topsoil will wash into the revetment and no vegetative cover will be established. All areas disturbed by the windrow construction process should be roughened and seeded as part of the construction completion.
- The windrow should be rectangular in cross section and the bottom of the trench should be three to five feet below the existing channel bottom.
- The ends of the windrow should be keyed back away from the channel by several feet. The keying helps establishing a smooth bank line and preventing the channel from eroding behind the windrow.
- The rock volume used within the windrow cross sectional area should be adequate for lining the final anticipated bank shape with excess volume provided to account for the unpredictable nature of riprap self placement.

Site-Specific Details

In each description, a classification of “Road at Risk” or “Road not at Risk” is determined based on the following definitions:

Road at Risk: Damage or impending damage at site deems road unsafe for travel in its current state.

Road not at Risk: While the road is safe for travel in its current state, it is susceptible to further damage from normal river erosive forces that would make travel unsafe if protective measures are not taken.

Site 1. Site 1 is located between mileposts 81 and 82. This is the only site located on the south side of SR-24. This site sustained some damage as a result of the August 23, 2003 flood and is considered Road at Risk. Some rock and soil from within the Park was placed between SR-24 and the Fremont River to serve as emergency repair. The damaged area extends approximately 153 feet in length. Of the four erosion control measures described previously, this site would benefit most from a combined improvement that includes bendway weirs and armored embankment. This strategy would reinforce the streambank, stabilize it from further erosion, and augment aquatic habitat in this area. The armored embankment would be keyed into the bank up and down stream, extending parallel to SR-24 on the upstream side past the curve. Weirs angled 20-30 degrees would be used on the downstream side of the curve, extending into the stream roughly 1/3 the width of the river. The existing armored embankment would be adjusted to a 1:1 slope, and bundles of willows would be planted within the riprap.

Site 2. This site is approximately 80 feet long and lies 35 feet from the shoulder stripe of the road at milepost 82.5. Old gabion baskets are visible at this site. Gabion baskets are riprap structures that are contained within wire mesh baskets. During the 2003 flood event, water breached the channel and flattened much of the vegetation in this area. This site is considered Road not at Risk because no immediate threat to SR-24 exists here, but if erosion controls were not installed, severe damage due to normal erosion would result. An armored embankment application at this site would provide the necessary bank stabilization qualities while incorporating the existing erosion control measure. An embankment with a slope of 2:1 or 3:1 that incorporates a bench at the streamside would maintain the natural meander and aquatic habitats of the river. Vegetation would be planted within the embankment and on the bench.

Site 3. This site is approximately 100 feet long and is 30 feet from the shoulder stripe at milepost 82.75. The distance from the shoulder stripe includes a pullout parking/viewing area for visitors. During the 2003 flood event, water flowed out onto SR-24 then back toward the river, undercutting existing riprap. This site is considered Road not at Risk because no immediate threat to SR-24 exists here, but if erosion controls are not sufficient, severe damage due to normal erosion would result. At this site, a test trench should be dug to determine how far into the slope the existing riprap extends. If the existing riprap extends toward SR-24, then no further action needs to be taken. The existing vegetation would remain, which is helping secure the bank. If the existing riprap lies only on the face of the bank, then a windrow revetment should be installed. Because of the distance to the traveled lane, windrow revetment would provide the necessary bank stabilization qualities and maintain the natural meander and aquatic habitats of the river at this site.

Site 4. SR-24 sustained some damage during the August 23, 2003 flood at this site and is considered Road at Risk. It is approximately 146 feet long and is located at milepost 83. Some natural rock from within the Park was placed on the bank as an emergency repair. The flood and emergency repair actions have damaged several large trees and shrubs. This site would best be served with a combination of armored embankment and bendway weirs to reinforce the streambank, stabilize it from further erosion, and augment aquatic habitat in this area. Armored embankment would be placed along the entire bank and bendway weirs would be placed on the upstream side of the bend. As is done elsewhere, appropriate vegetation, such as willows, would be planted within the embankments.

Site 5. This site is approximately 160 feet in length and is 26 feet from the shoulder stripe at milepost 81.5. The area between SR-24 and the river is largely devoid of vegetation or rocks. It was determined that while no immediate threat to SR-24 exists here, if the river is not directed away from the roadway, severe damage due to normal erosion would result. Therefore, this site is considered Road not at Risk. In this case, some armored embankment on the upstream side of the bend with boulder toe protection to control erosion and bendway weirs to redirect flows and improve aquatic habitats, would be the most beneficial action. Armored embankment would be placed on the upstream side of the bend to reinforce the existing bench. Boulder toe protection and bendway weirs would begin where the existing vegetation ends and extend downstream to where the vegetation is growing. Additionally, the riverbank would be re-contoured and seeded/mulched.

Site 6. This site is approximately 250 feet in length and only 6 feet from the shoulder stripe at milepost 83.8. During the 2003 flood event, large boulders from previous riprap placements were carried downstream. As a result of the erosion, old gabion baskets are now visible. Because of the close proximity of SR-24 to the river and the aggressive erosive action, this site is considered Road at Risk. Armored embankment would be the best option to reinforce the streambank and stabilize it from further erosion. To augment aquatic habitats, the boulders that were carried downstream would be removed and appropriate vegetation would be placed within the embankment.

Site 7. This site is approximately 310 feet long and is 6 feet from the shoulder stripe at milepost 84.2. This is a straight section of the river. There are old gabion baskets visible. During a site visit, it was determined that while no immediate threat to SR-24 exists here. Therefore, this site is considered Road not at Risk and preventative action is not warranted.

Site 8. This site is much like Site 7 in characteristics and is not in need of immediate stabilization measures. It is considered Road not at Risk. While no immediate threat to SR-24 exists here, if the river is not directed away from the roadway, severe damage due to normal erosion would result. It is approximately 58 feet long and roughly 6 feet from the shoulder stripe at milepost 84.6. Bendway weirs would function in this area to augment aquatic habitats, while boulder toe protection would reinforce the bank stabilization efforts of the existing gabion baskets. The weirs would extend into the stream approximately 1/3 of the total stream width.

Site 8A. This site was identified as a potential site in crucial need of preventive measures. It measures approximately 84 feet long and is 3 feet from the shoulder stripe at milepost 84.8. It is characterized by large washed out riprap boulders. This site is considered Road not at Risk because no immediate threat to SR-24 exists here, but if erosion control measures were not taken; severe damage due to normal erosion would result. An armored embankment treatment with boulders keyed into the slope, creating a small bench, would secure the bank and augment

habitats at this site. The slope would be revegetated to add erosion control qualities and the shoulder curb would be replaced to limit undercutting from water flowing off the roadway.

Site 9. This site is located at milepost 85.6 and is approximately 132 feet long and is 42 feet from the shoulder stripe, which includes a pullout parking/viewing area. In 1985, a channel was cut in an attempt to direct the river from meandering toward SR-24. However, the river breached that dike and has resumed its natural meander. Existing vegetation thrives in the area. This site is considered Road not at Risk because no immediate threat to SR-24 exists here, but if erosion controls were not taken; severe damage due to normal erosion would result. Placing boulders, keyed into the slope behind the vegetation, and sloping the banks back would be best here. This application would maintain the existing vegetation and slow the river's natural migration. Sloping the banks back would result in an armored embankment type of erosion control measure.

Site 10. This site is approximately 130 feet long and 20 feet from the shoulder stripe at milepost 86.8. The flood eroded previous riprap efforts and dislodged boulders are evident. This site is considered Road at Risk. Because the river is working against the banks considerably at this site, an armored embankment application would provide the necessary preventative protection. Appropriate vegetation would be planted within the embankment and all along the bank.

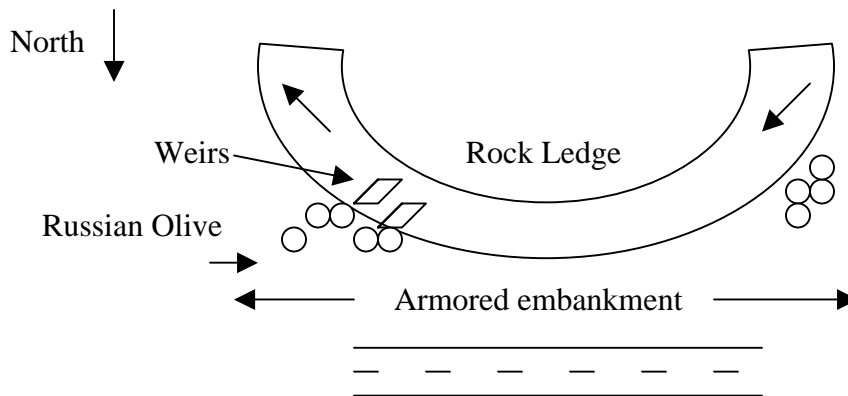
Site 11. This site is approximately 140 feet long and about 100 feet from the shoulder stripe at milepost 88.95. The flood eroded previous riprap efforts and heavy bank erosion is evident. During a site visit, it was determined that while no immediate threat to SR-24 exists here, if the river is not directed away from the roadway, severe damage due to normal erosion would result. Therefore, this site is considered Road not at Risk and preventative action is warranted. To best protect the bank here, the slope should be cut back and the bank reinforced. Armored embankment, along with revegetation, would control erosion and improve aquatic habitats at this site.

Site Visit Notes

Site #1, MP 81.5

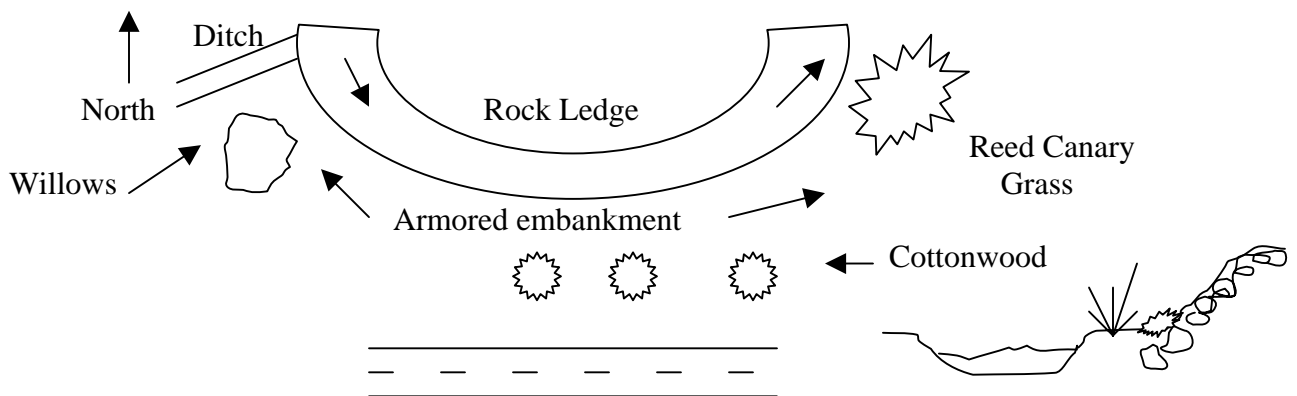
Without changing the alignment of the river, some surface roughness should be added so the speed of the river does not increase. This can be done with some boulders. Plant bundles of willows in the rip rap.

The armored embankment should be keyed into the bank up and down stream. On the up stream side, once we get around the curve far enough we should run parallel to the road with the protection. Armored embankments already exists, we need to make slope a 1:1. Put a couple of weirs near the end of the bend in the river. The weirs should be a flatter design with a 20 or 30-degree angle. The Weirs should not be so far out in the stream either; typically they would be one-third the width of the river in length. We need to also plant some willows in the banks more towards the up streamside.



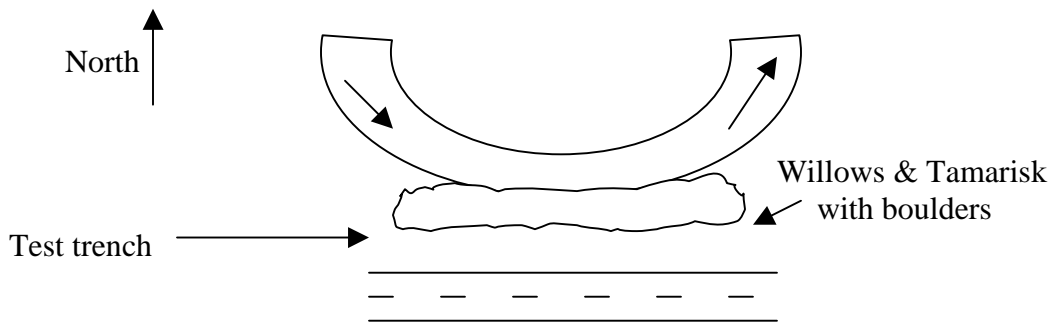
Site #2, Mp 82.5

Armored embankment would work here to protect the banks and securing them. Possible idea for here is an armored bank with a good slope, 2:1 or 3:1 with a bench-like design as shown below. Allowing for some vegetation to grow on the bench. This bank has not moved in a long time. The measures put in place about 15 years ago are still there and not much has moved or happened in that period of time. On the up stream side we will go to the culvert and on the down stream side to the patch of grass.



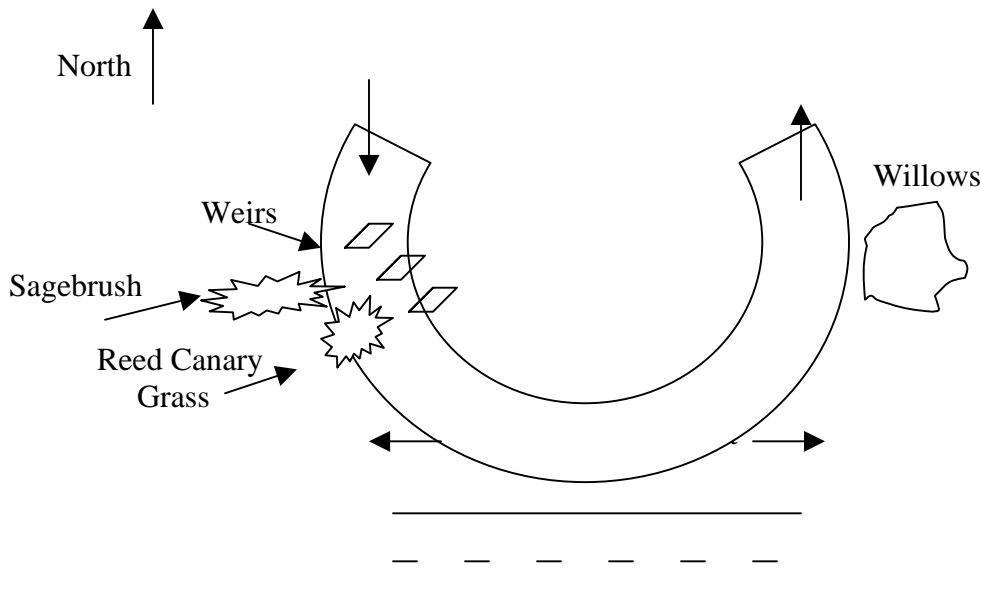
Site #3, MP 82.75

We don't want to disturb the existing vegetation if at all possible. They are established well and are helping to secure the bank. There are existing rocks along the banks similar to the armored embankment. We need to dig a test trench to see how far back those rocks go. If they are only on the face of the bank we need to do a windrow revetment. If the rocks have been placed back into the banks towards the road we will not do anything else at this site. The vegetation here is good and if we disturb the banks it will only set us back.



Site #4, MP 83

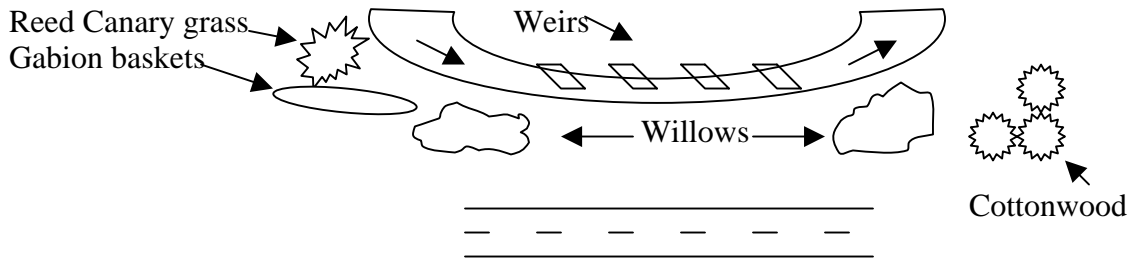
We will tie the bank back on the up and down stream sides. On the portion of river that runs parallel to the road we will just do an armored embankment to reinforce the slope. Weirs will be placed on the up stream side of the bend but not on the down steam side. There will be armored embankments along the entire bank here.



Site #5, MP 81.5

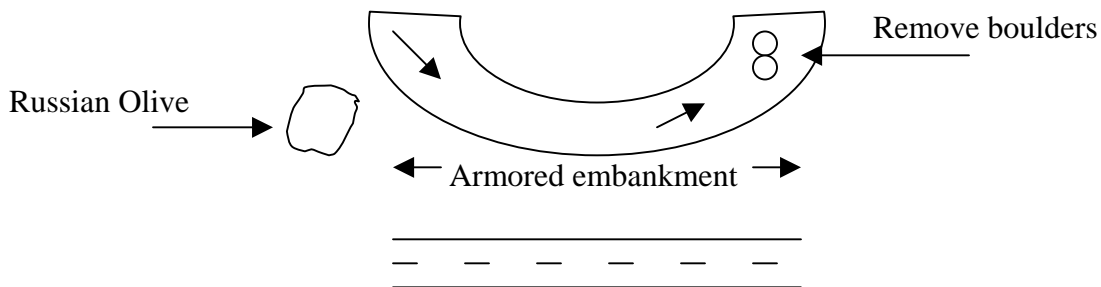
We can lay the slope back a little bit on the up stream side and reinforce the existing bench by armoring up the banks in this area. The boulder toe protection will start where

the energy picks up and the vegetation dwindles out. The Bendway weirs will also start where we start the boulder toe protection. We can tie back into the bank on the down stream side just past the willow patch. Re-contour, seed/mulch the riverbank,



Site #6, MP 83.8

NPS wants us to remove the rocks out of the stream that have migrated from the banks into the channel. Here we will reinforce the banks and make it look better. The flow around this curve is slow and does not carry much energy with it. No weirs are needed here. Plant willows in the banks.



Site #7, MP 84.2

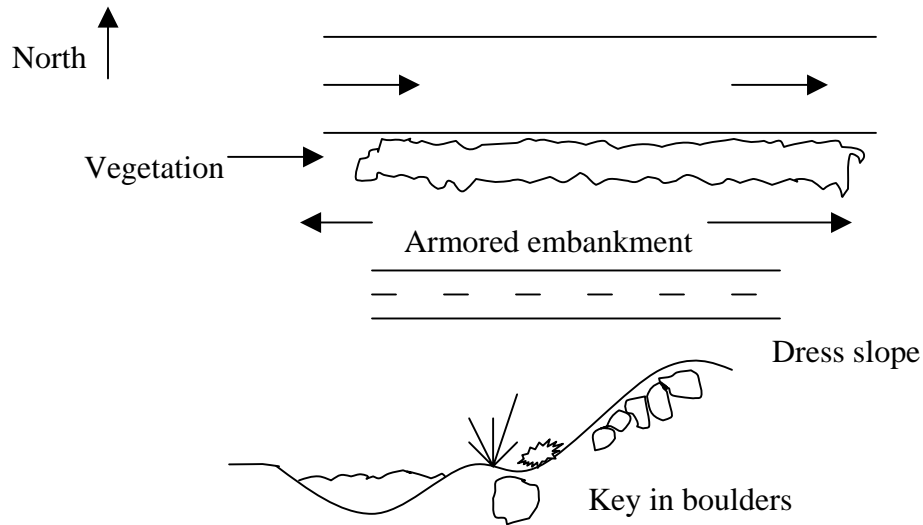
The banks have extensive vegetation and don't seem to be threatened much by the river. We don't feel that anything needs to be done in this area.

Site #8, MP 84.6

Bendway weirs and boulder toe protection will work well here. The weirs generally will go out into the stream one-third the width of the river.

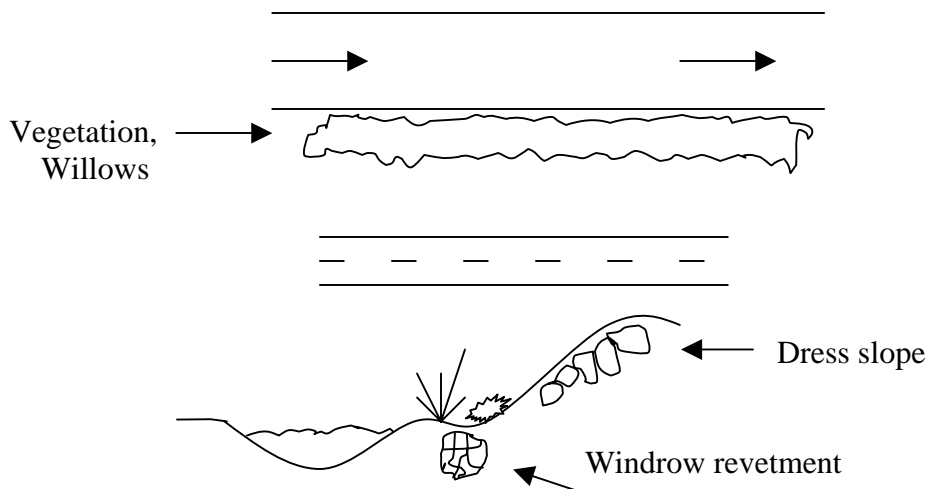
Site #8a, MP 84.8

Here we want to key the toe of the slope in without getting into the channel and dress up the slope to make it look better. Do almost a windrow revetment to prevent any future problems. The shoulder curb needs to be replaced. Much of the damage at this site appears to be coming from water running from the road to the river. There is not a designated area for the water to run, it just goes where it wants to. We could make a little diversion here and stop any future erosion on the upper side of the bank.



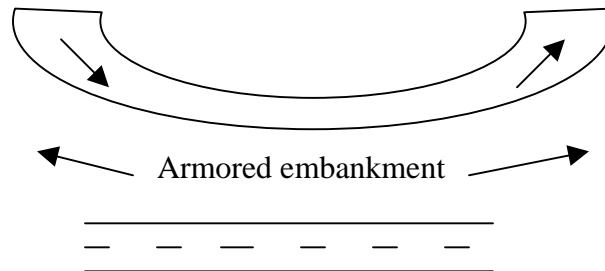
Site #9, MP 85.6

There is a large wash area that has been caused by water coming from the road to the river. We need to armor the wash area and divert it into a single location. Here we will key in boulders behind the vegetation and slope the banks back. We will also dress up the slope like an armored embankment.



Site # 10, MP 86.8

We want to key in the toe and armor up the bank. The area affected is very long; the river is working against the banks a lot. Re-vegetate the area.



Site # 11, MP 88.95

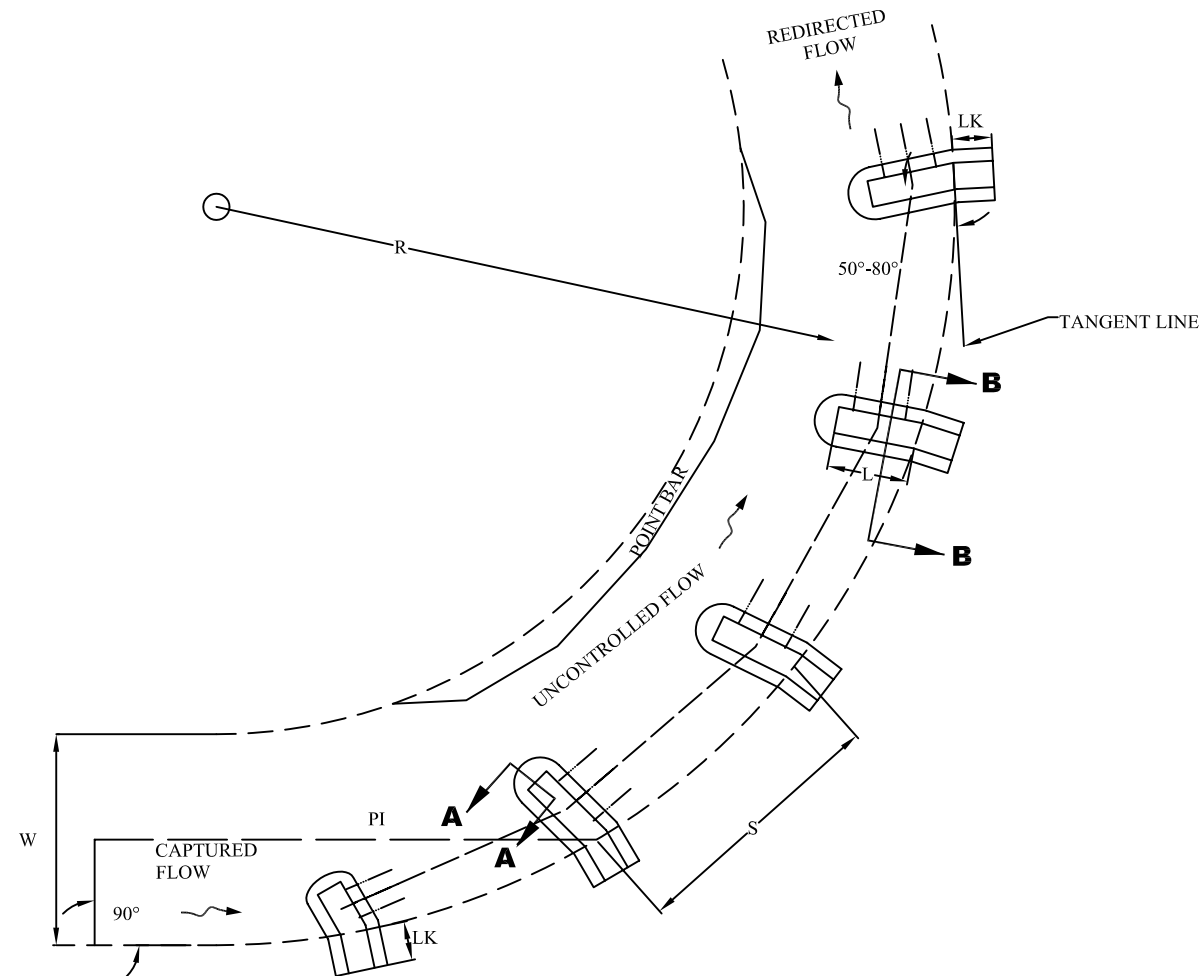
Here we want to cut back the slope and reinforce the bank. There is about a 15-foot ledge and the weirs will not be needed if we do armored bank. We will remove and replace the fence.

General:

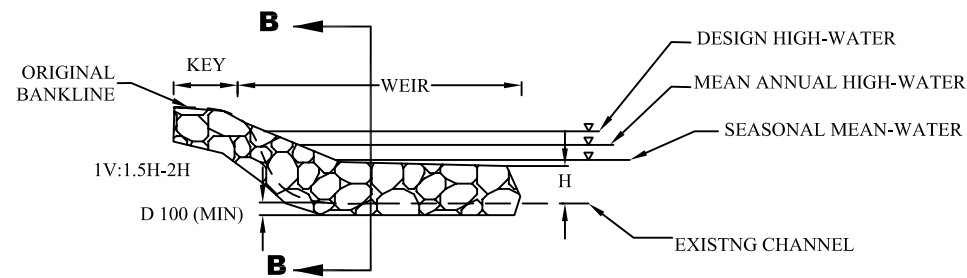
** Native soil will be placed over the armored embankment measures that do not fit in with the surrounding area. This allows for a good medium for the seed and mulch.

** All disturbed areas including access locations for construction will be seeded and mulched.

** Armored embankment measures should have willow or willow/cottonwood plantings if enough space exists between the river and road.



PLAN VIEW



SECTION A-A



SECTION B-B

NOTES:

REGARDLESS OF WHAT THE FHWA DIAGRAMS SHOW, LARGE ROCK (GREATER THAN 18" IN DIAMETER) SHOULD BE USED FOR THE CONSTRUCTION OF THE BENDWAY WEIRS. PILES OF SMALL ROCKS CAN BE EASILY ERODED OR REMOVED BY VANDALISM. ROCK USED OF THE WEIRS SHOULD HAVE A GREATEST DIMENSION NOT GREATER THAN THREE TIMES ITS LEAST DIMENSION, AND HAVE A SPECIFIC GRAVITY OF NO LESS THAN 2.5.

ROCK PLACEMENT NEEDS TO BE PERFORMED COGNIZANT OF IMPACTS CAUSED BY POTENTIAL HIGH FLOWS. ROCKS COMPRISING THE TOP OF THE WEIR NEED TO BE STABLE.

THE WEIRS NEED TO BE EMBEDDED INTO THE RIVERBANK BY SEVERAL FEET.

- LK - LENGTH OF KEY
- L - LENGTH OF WEIR
- S - SPACING
- W - CHANNEL WIDTH
- R - RADIUS OF CURVATURE
- PI - POINT OF MIDSTREAM TANGENT FLOWLINE INTERSECTION
- TW -TOP WIDTH

Computer File Information				Sheet Revisions			As Constructed	BENDWAY WEIRS SR-24 CAPITOL REEF EA			Project No./Code	
Creation Date:		Initials:	<div>R-</div>	.	.	.		No Revisions:		.	.	
Last Modification Date:		Initials:	<div>R-</div>	.	.	.		Revised:	Designer:	KEK, RJE	Structure Numbers	
Full Path:			<div>R-</div>	.	.	.			Detailer:	MNZ		
Drawing File Name:				<div>R-</div>	.	.		Void:	Sheet Subset:		Subset Sheets: of	Sheet Number
Acad Ver. 2002		Scale: AS SHOWN	Units: ENGLISH	<div>R-</div>	.	.			.			

NOTES:

RIPRAP USED FOR PROTECTING THE EMBANKMENT SHOULD HAVE A MINIMUM D50 OF APPROXIMATELY 12 INCHES, BE WELL GRADED, COMPRISED OF ANGULAR STONES HAVING A GREATEST DIMENSION NOT GREATER THAN THREE TIMES ITS LEAST DIMENSION, HAVE A SPECIFIC GRAVITY NO LESS THAN 2.5.

RIPRAP COMPRISING THE EMBANKMENT ARMORING SHOULD BE PLACED AT A 3:1 ROCK TO SOIL RATIO. THE SOIL FILLS THE VOIDS WITHIN THE REVETMENT AND PROVIDES A MEDIA FOR VEGETATION GROWTH. NOT INCLUDING THE 3:1 RATIO MIGHT NECESSITATE THE PLACEMENT OF A FILTER LAYER OR GEOTEXTILE BETWEEN THE RIPRAP AND THE RE-GRADED EMBANKMENT.

IF THE REMOVAL OF FINE MATERIALS FROM UNDER AND BEHIND THE EMBANKMENT ARMORING IS OF CONCERN, A GEOTEXTILE SHOULD BE PLACED UNDER THE RIPRAP REVETMENT. PLACEMENT OF THE 3:1 RATIO MAY NOT BE ADEQUATE FOR CREATING A PERMANENT ARMORING IF THE BANK IS COMPRISED OF HIGHLY ERODIBLE MATERIAL. THE GEOTEXTILE SHOULD EXTEND INTO THE ACTIVE CHANNEL UNDER THE TOE OF THE EMBANKMENT ARMORING. THE SELECTED GEOTEXTILE SHOULD BE TIGHT ENOUGH FOR PREVENTING THE WASHING OF FINE MATERIALS, AND STRONG ENOUGH TO WITHSTAND THE PUNCTURE AND TEAR FORCES ASSOCIATED WITH ROCK PLACEMENT.

THE RESHAPED EMBANKMENT SHALL BE GRADED AT A MAXIMUM SLOPE OF 2 HORIZONTAL TO 1 VERTICAL. THE RIPRAP REVETMENT WILL NOT BE STABLE FOR SLOPES STEEPER THAN THIS.

THE TOP OF THE RIPRAPPED EMBANKMENT SHOULD BE COVERED WITH SEVERAL INCHES OF TOPSOIL AND HEAVILY SEEDED WITH A HEARTY NATIVE SEED MIXTURE. IF THE 3:1 ROCK TO SOIL RATIO IS NOT INCLUDED IN THE DESIGN, THE LAYER OF TOPSOIL WILL WASH INTO THE REVETMENT AND NO VEGETATIVE COVER WILL BE ESTABLISHED. ALL AREAS DISTURBED BY THE ARMORED EMBANKMENT CONSTRUCTION PROCESS SHOULD BE ROUGHENED AND SEEDED AS PART OF THE CONSTRUCTION COMPLETION.

WILLOW CUTTINGS SHOULD BE PLACED ALONG THE TOE OF THE REVETMENT WITHIN THE RIPRAP MATRIX. THE LOCAL CONSERVATION SERVICE SHOULD BE CONTACTED AS TO CRITERIA ASSOCIATED WITH PLACEMENT TECHNIQUES AND PLANTING SEASON. IMPROPERLY PERFORMED OR TIMED WILLOW PLANTINGS HAVE A VERY LOW CHANCE OF SURVIVAL. THE WILLOW STAKINGS NEED TO PENETRATE THE RIPRAP LAYER AND GEOTEXTILE (IF USED).

THE TOE OF THE EMBANKMENT ARMORING SHALL EXTEND INTO AND BELOW THE RIVER BY SEVERAL FEET. FOR THIS PROJECT, THREE TO FIVE FEET SHOULD BE ADEQUATE.

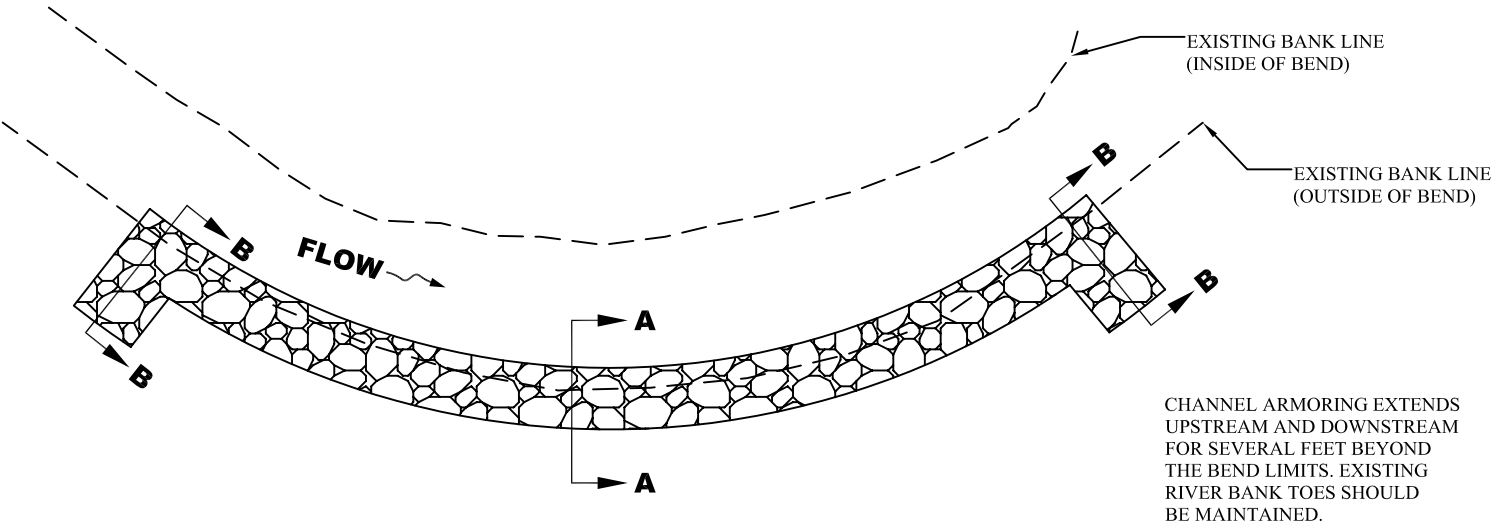
IN SITU RIVER BOTTOM MATERIALS EXCAVATED FOR THE RIVER FOR CONSTRUCTION OF THE EMBANKMENT SLOPE AND TOE SHOULD BE INCLUDED IN THE VISIBLE SECTIONS OF THE FINISHED REVETMENT CROSS SECTION FOR AIDING IN CAMOUFLAGING OF THE BANK STABILIZATION.

THE ENDS OF THE EMBANKMENT ARMORING SHOULD BE KEYED BACK AWAY FROM THE CHANNEL BY SEVERAL FEET. THE KEYING HELPS PREVENT THE CHANNEL FROM ERODING BEHIND THE EMBANKMENT ARMORING.

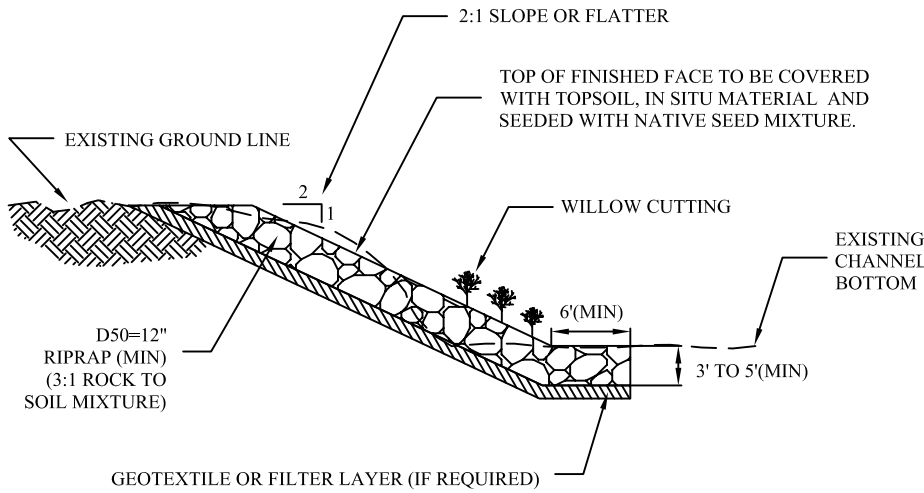
IT IS RECOMMENDED THAT A TRACK-HOE OR OTHER HEAVY CONSTRUCTION EQUIPMENT BE DRIVEN OVER THE FINAL SECTION OF EMBANKMENT ARMORING TO CREATE A MORE INTERLOCKED RIPRAP LAYER AND TO SINK IT INTO THE NEWLY RE-GRADED SLOPE. PLACEMENT OF IN SITU MATERIALS AND TOPSOIL SHOULD BE DONE AFTER THIS STEP.

TRANSITIONS MAY NEED TO BE GRADED BETWEEN THE SECTION PROTECTED BY THE ARMORED EMBANKMENT AND THE ADJACENT UNPROTECTED CHANNEL BANK LINE. DRASTIC TRANSITIONS REQUIRE LARGER OR MORE ROBUST KEYED IN AREAS TO PREVENT UNDERMINING OR REMOVAL OF THE EMBANKMENT ARMORING. USE STRAW OR COCONUT EROSION BLANKET OVER THE TOPSOIL TO HOLD SEED AND PREVENT RILL EROSION PRIOR TO VEGETATIVE GROWTH.

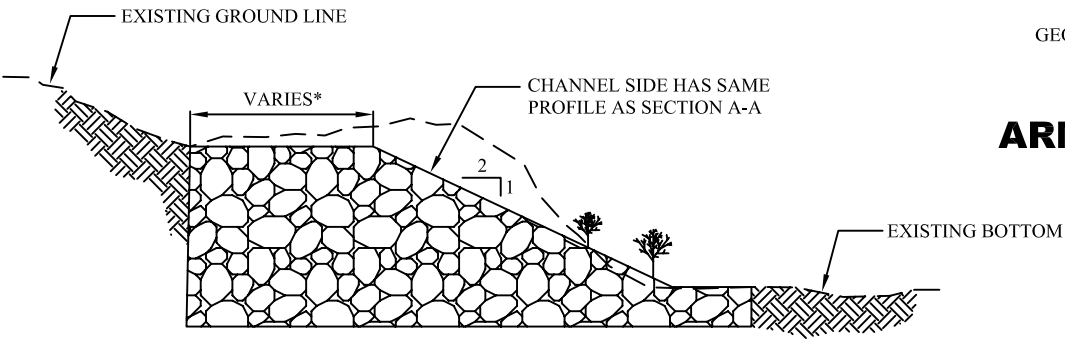
USE STRAW OR COCONUT EROSION BLANKET OVER THE TOPSOIL TO HOLD SEED AND PREVENT RILL EROSION PRIOR TO VEGETATIVE GROWTH.



PLAN VIEW
TYPICAL RIVER BEND



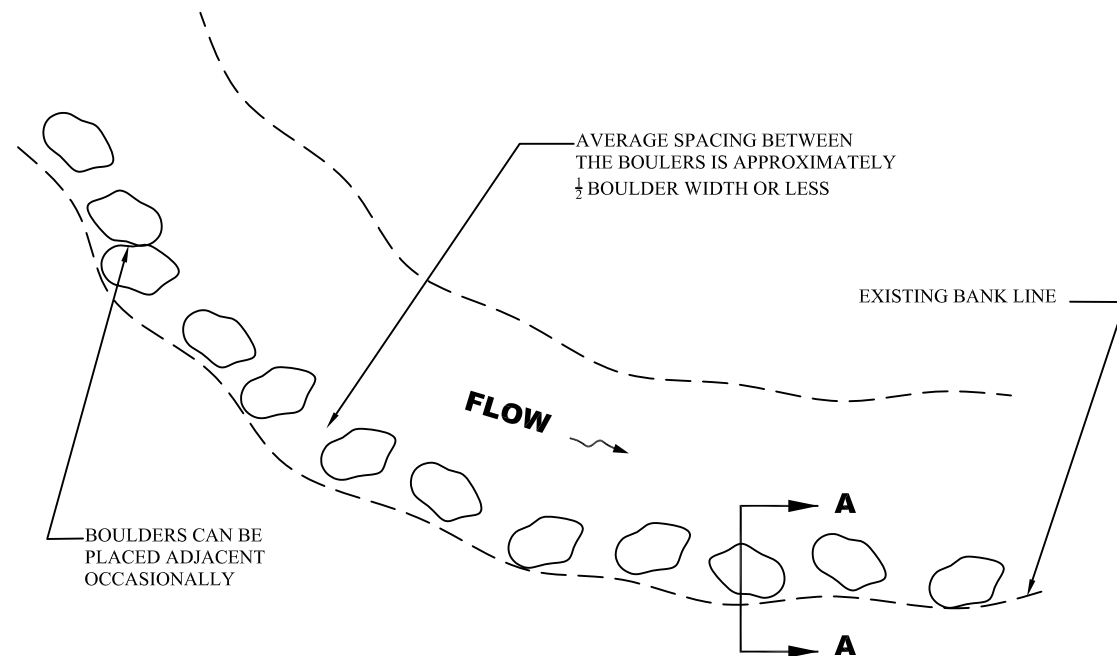
SECTION A-A
ARMORED EMBANKMENT SECTION



SECTION B-B
KEYED IN SECTION

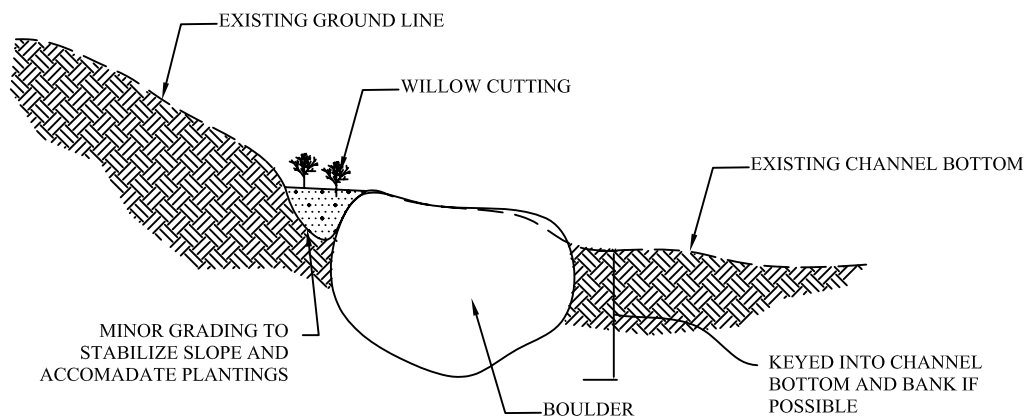
* LENGTH KEYED INTO THE CHANNEL BANK VARIES FROM LOCATION TO LOCATION. KEYED IN LENGTHS WILL BE DETERMINED BY SITE INSPECTION BY QUALIFIED INDIVIDUALS.

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Last Modification Date:	Initials:	(R-)	.	.	.	Revised:		.	Designer:	KEK, RJE	Structure
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Drawing File Name:		(R-)	.	.	.				Sheet Subset:		
Acad Ver. 2002	Scale: AS SHOWN	Units: ENGLISH	(R-)	.	.				Subset Sheets:	of	Sheet Number



PLAN VIEW

TOE BOULDERS TO EXTEND UP STREAM AND DOWN STREAM FOR SEVERAL FEET BEYOND THE BEND LIMITS. BOULDERS UP STREAM OF THE BEND SHALL BE KEYED INTO THE CHANNEL BOTTOM AND INTO THE RIVER BANK TO PREVENT FLOWS FROM ERODING BEHIND THE BOULDER.



SECTION A-A

NOTES:

BOULDERS USED FOR PROTECTING THE EMBANKMENT SHOULD HAVE A MINIMUM D50 OF APPROXIMATELY 36 INCHES, ITS GREATEST DIMENSION NOT GREATER THAN THREE TIMES ITS LEAST DIMENSION AND HAVE A SPECIFIC GRAVITY NO LESS THAN 2.5.

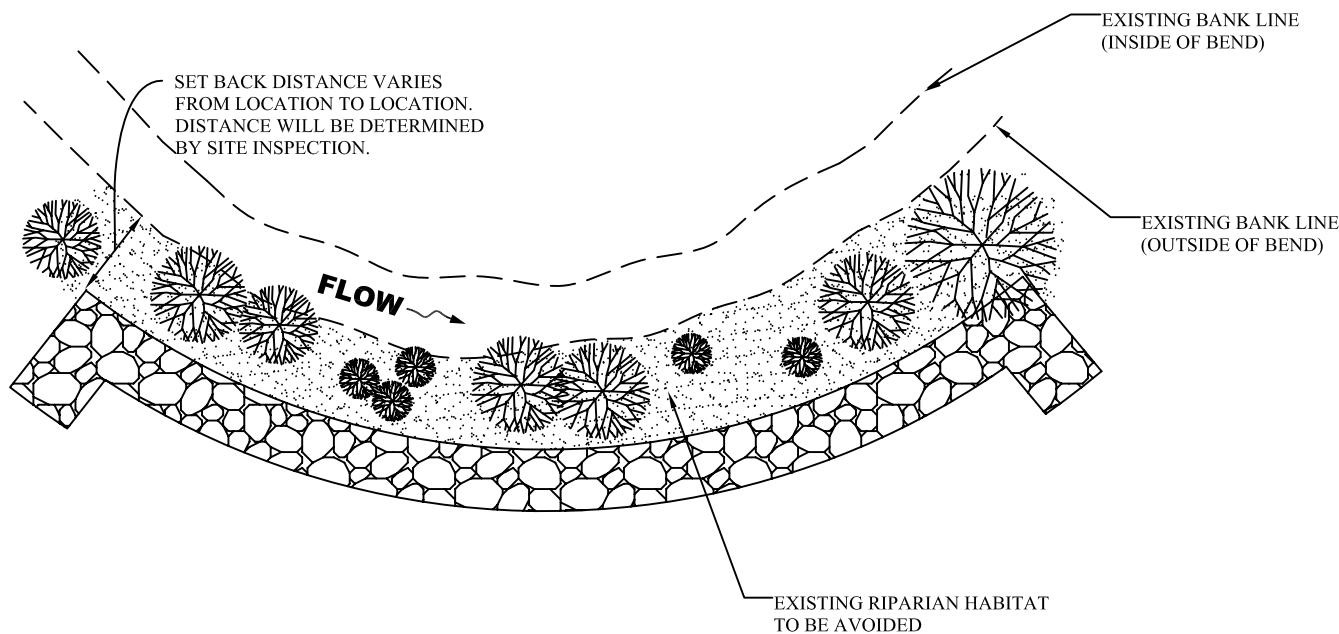
BOULDERS SHOULD BE KEYED INTO THE RIVER BOTTOM AND RIVERBANK BY AT LEAST 12 TO 18 INCHES.

WILLOW CUTTINGS SHOULD BE PLACED BETWEEN AND BEHIND THE BOULDERS. THE LOCAL CONSERVATION SERVICE SHOULD BE CONTACTED AS TO CRITERIA ASSOCIATED WITH PLACEMENT TECHNIQUES AND PLANTING SEASON. IMPROPERLY PERFORMED OR TIMED WILLOW PLANTINGS HAVE A VERY LOW CHANCE OF SURVIVAL.

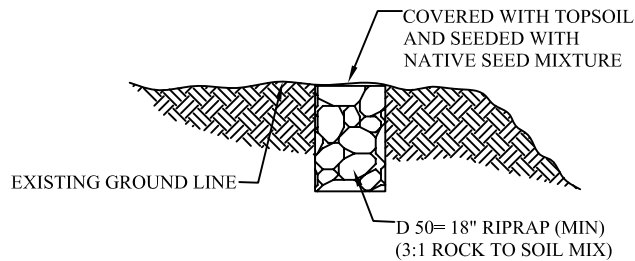
BOULDERS SHOULD BE PLACED UPSTREAM AND DOWNSTREAM FOR A DISTANCE TO REDUCE THE VISUAL IMPACT ASSOCIATED WITH THE ALTERNATIVE.

PERFORM LOCALIZED GRADING ACTIVITIES BEHIND LARGE BOULDERS OR SETS OF BOULDERS.

Computer File Information		Sheet Revisions			As Constructed	BOULDER TOE PROTECTION SR-24 CAPITOL REEF EA			Project No./Code
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Acad Ver. 2002	Scale: AS SHOWN	Units: ENGLISH	<div>R-</div>	.	Void:	.	Detailer: MNZ		
					Sheet Subset:		Subset Sheets:	of	Sheet Number



PLAN VIEW



SECTION A-A

NOTES:

THE ROCK WITHIN THE WINDROW SHOULD HAVE A MINIMUM D50 OF APPROXIMATELY 18 INCHES, BE WELL GRADED, BE COMPRISED OF ANGULAR STONES, BE COMPRISED OF STONES HAVING A GREATEST DIMENSION NOT GREATER THAN THREE TIMES ITS LEAST DIMENSION, AND HAVE A SPECIFIC GRAVITY NO LESS THAN 2.5.

RIPRAP WITHIN THE WINDROW SHOULD BE PLACED AT A 3:1 ROCK TO SOIL RATIO. THE SOIL FILLS THE VOIDS WITHIN THE REVETMENT AND PROVIDES A MEDIA FOR VEGETATION GROWTH.

THE TOP OF THE WINDROW TRENCH SHOULD BE COVERED WITH SEVERAL INCHES OF TOPSOIL AND HEAVILY SEEDED WITH A HEARTY NATIVE SEED MIXTURE. IF THE 3:1 ROCK TO SOIL RATIO IS NOT INCLUDED IN THE DESIGN, THE LAYER OF TOPSOIL WILL WASH INTO THE REVETMENT AND NO VEGETATIVE COVER WILL BE ESTABLISHED. ALL AREAS DISTURBED BY THE WINDROW CONSTRUCTION PROCESS SHOULD BE ROUGHENED AND SEEDED AS PART OF THE CONSTRUCTION COMPLETION.

THE WINDROW SHOULD BE RECTANGULAR IN CROSS SECTION AND THE BOTTOM OF THE TRENCH SHOULD BE THREE OR FOUR FEET BELOW THE EXISTING CHANNEL BOTTOM.

THE ENDS OF THE WINDROW SHOULD BE KEYED BACK AWAY FROM THE CHANNEL BY SEVERAL FEET. THE KEYING HELPS ESTABLISHING A SMOOTH BANK LINE AND PREVENTING THE CHANNEL FROM ERODING BEHIND THE WINDROW.

Computer File Information		Sheet Revisions			As Constructed	WINDROW REVETMENT SR-24 CAPITOL REEF EA			Project No./Code
Creation Date:	Initials:	<div>R-</div>	.	.		No Revisions:		.	
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Acad Ver. 2002	Scale: AS SHOWN	Units: ENGLISH	<div>R-</div>

APPENDIX C

Site Photographs



Site 1



Site 1



Site 2



Site 2



Site 3



Site 3



Site 4



Site 4



Site 5



Site 5



Site 6



Site 6



Site 7



Site 7



Site 8



Site 8



Site 8A



Site 8A



Site 9



Site 9



Site 10



Site 10



Site II

APPENDIX D
Statement of Findings
Regarding Floodplain
Capitol Reef National Park
SR-24/Fremont River Erosion Control Project

**Statement of Findings
Regarding Floodplain
Capitol Reef National Park
SR-24/Fremont River Erosion Control Project**

RECOMMENDED: _____
Superintendent, Capitol Reef National Park, National Park Service **DATE**

CONCURRED: _____
Chief, Water Resources Division, National Park Service **DATE**

CONCURRED: _____
Environmental Quality Specialist, Intermountain Region, National Park Service **DATE**

APPROVED: _____
Regional Director, Intermountain Region, National Park Service **DATE**

**Statement of Findings
Regarding Floodplain
Capitol Reef National Park
SR-24/Fremont River Erosion Control Project**

Introduction

Pursuant to Executive Order 11988 (Floodplain Management) Director's Order #77-2 (Floodplain Management) of 2003, the National Park Service has evaluated flooding hazards for erosion control improvements to the Fremont River bank and stabilization measures for Utah State Route (SR)-24 in Capitol Reef National Park (Park), Wayne County, Utah. This statement of findings describes the proposed action, project site, use of floodplain, and flood risks associated with the proposed action.

Proposed Action

SR-24, the main access road to the Park and a designated scenic byway, crosses the Park between the towns of Torrey to the west and Hanksville to the east (Figure 1). Within the Park, SR-24 follows the Fremont River, a perennial river, from the eastern boundary to just east of the visitor center. Because the river and road are located in the bottom of an incised, narrow canyon, during periods of high water, the road bank suffers increased threats of erosion, prompting the Utah Department of Transportation (UDOT) to periodically fortify the bank and install erosion control measures, including stream flow controls.

Several years of such streambank fortification and stream flow control measures, coupled with the largest flood event within the last 19 years, which occurred on August 23, 2003, has necessitated erosion control work on SR-24.

The proposal includes clearing debris, installing erosion control/bank stabilization measures, and replanting vegetation. The erosion control/bank stabilization measures would be installed at 12 predetermined sites (Figure 2). Installation of erosion control/bank stabilization measures would repair damage to streambanks that support SR-24, improving the safety of the highway. The erosion control/bank stabilization work would also include habitat improvements at sites that would undergo construction activities.

Justification for Use of the Floodplain

As stated in Director's Order 77-2, Executive Order 11988 was issued "to avoid to the extent possible the long and short term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct or indirect support of floodplain development wherever there is a practicable alternative." The NPS has prepared an Environmental Assessment in which the preferred alternative describes the installation of the erosion control/bank stabilization measures. The measures would be installed along SR-24, which lies within the floodplain of the Fremont River. Should the erosion control/bank stabilization measures not be installed, the functionality of SR-24 would be compromised, negatively affecting transportation safety. Access to Park attractions would be compromised as well. As part of the proposed action, streamside and aquatic habitats would be improved, resulting in a more natural setting for wildlife and visitors. The Park has determined that in order to maintain the integrity of SR-24 and in order to maintain healthy riverside habitats, the proposed action is necessary.

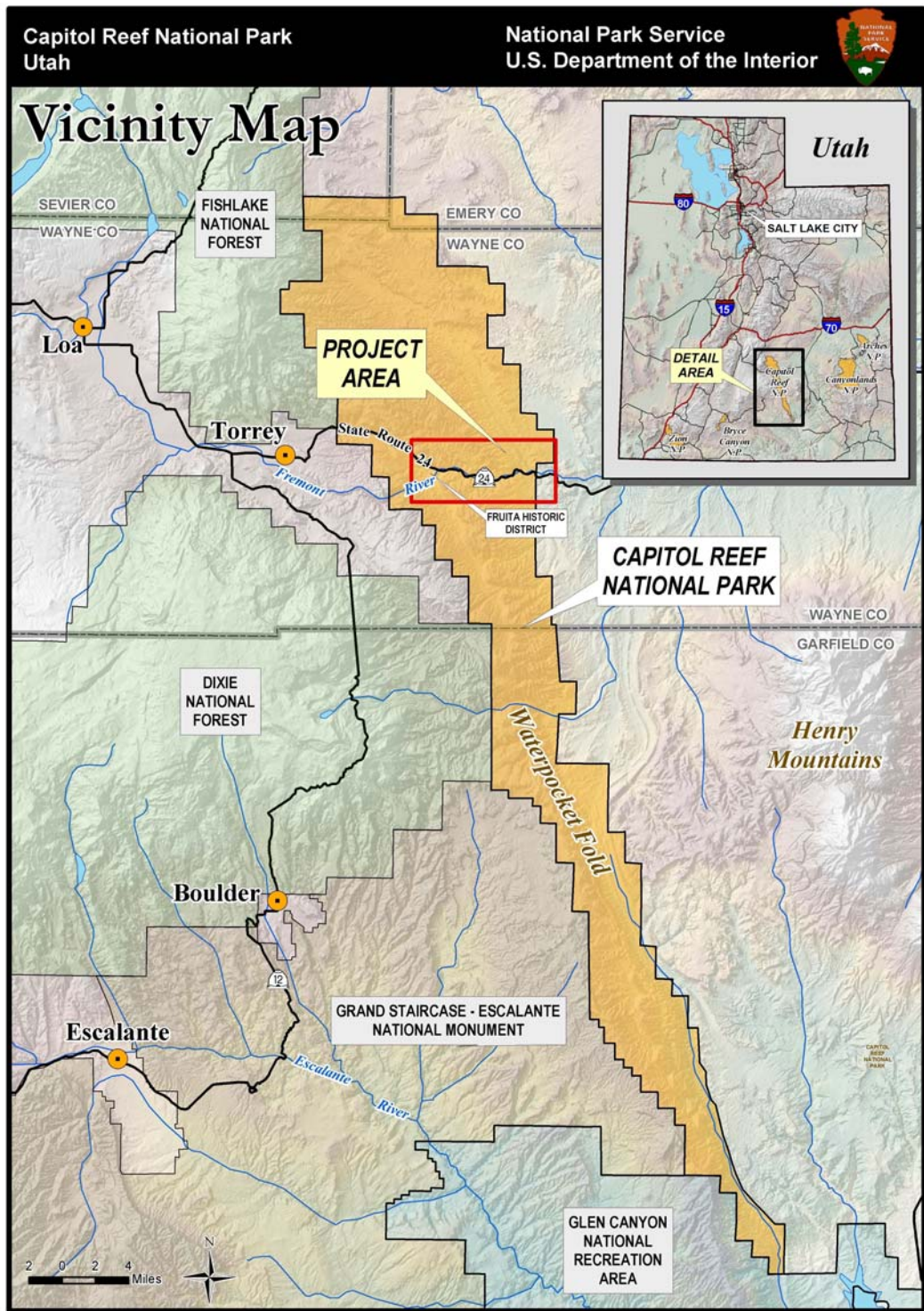


Figure 1. Vicinity Map



State Route 24

CAPITOL REEF NATIONAL PARK

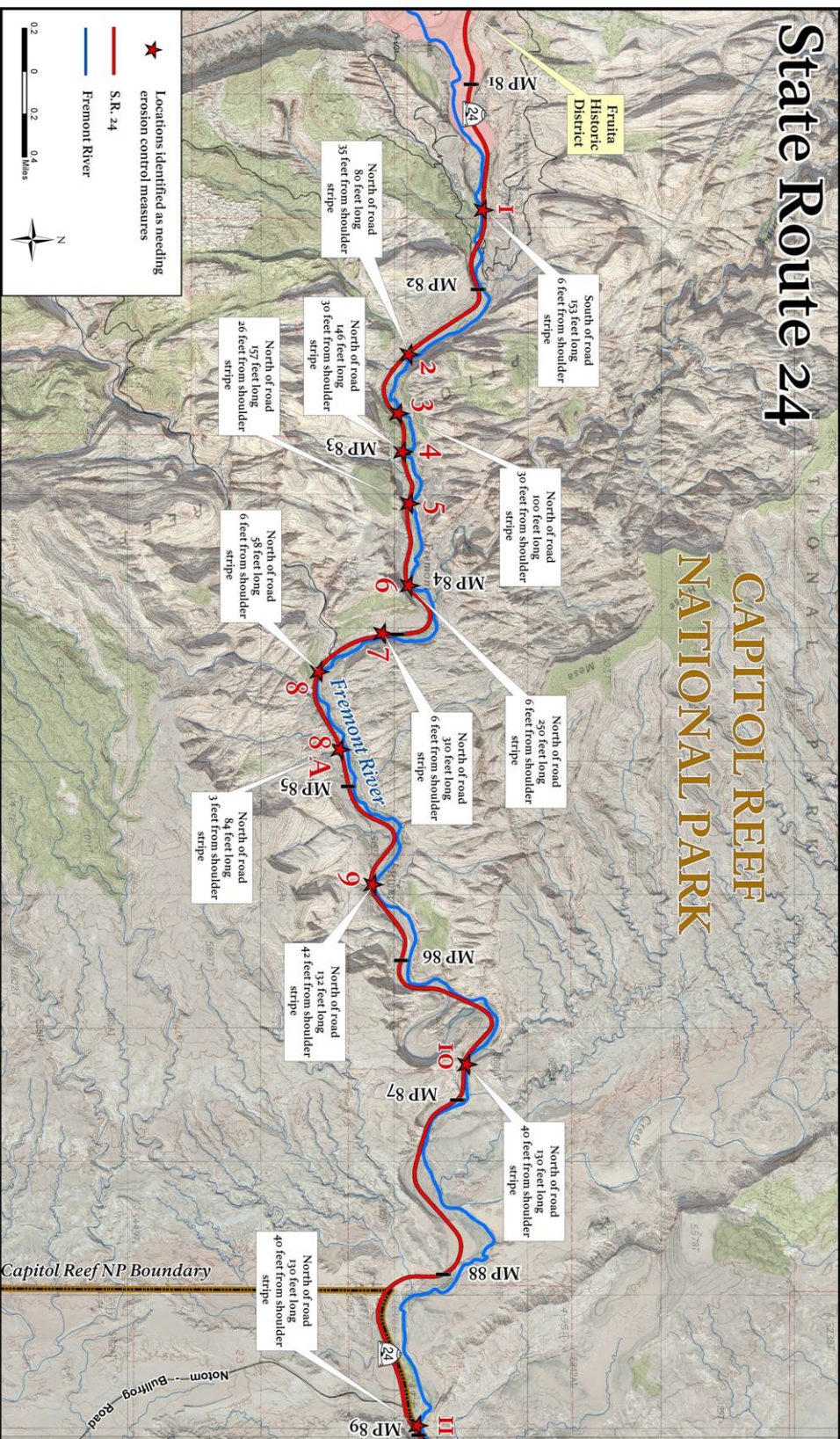


Figure 2. Project Area

Site-Specific Flood Risk

The proposed project areas lie along the Fremont River between the river and SR-24. This stream system is susceptible to surge-release flood flows, such as the 2003 flood. During these events, severe erosion of the streambank and roadbase may occur. The 2003 flood undercut existing erosion control features, causing their collapse and failure. Materials supporting the roadbed were then susceptible to erosion, resulting in failure of certain paved areas.

Flood Mitigation Plans

The project would occur at several previously impacted sites along SR-24. Natural drainage patterns would be maintained to the extent practicable at each site. Vegetation would be planted at each site to hold soils in place and augment streamside habitats.

The road would continue to be monitored by UDOT maintenance personnel to assure its integrity. In the event a severe flood threatens SR-24, the road would be closed and traffic diverted to safely avoid the danger.

Summary

With the above mitigation measures in place, the Park determines that the natural floodplain values would be protected and potentially hazardous conditions associated with flood events would be minimized.